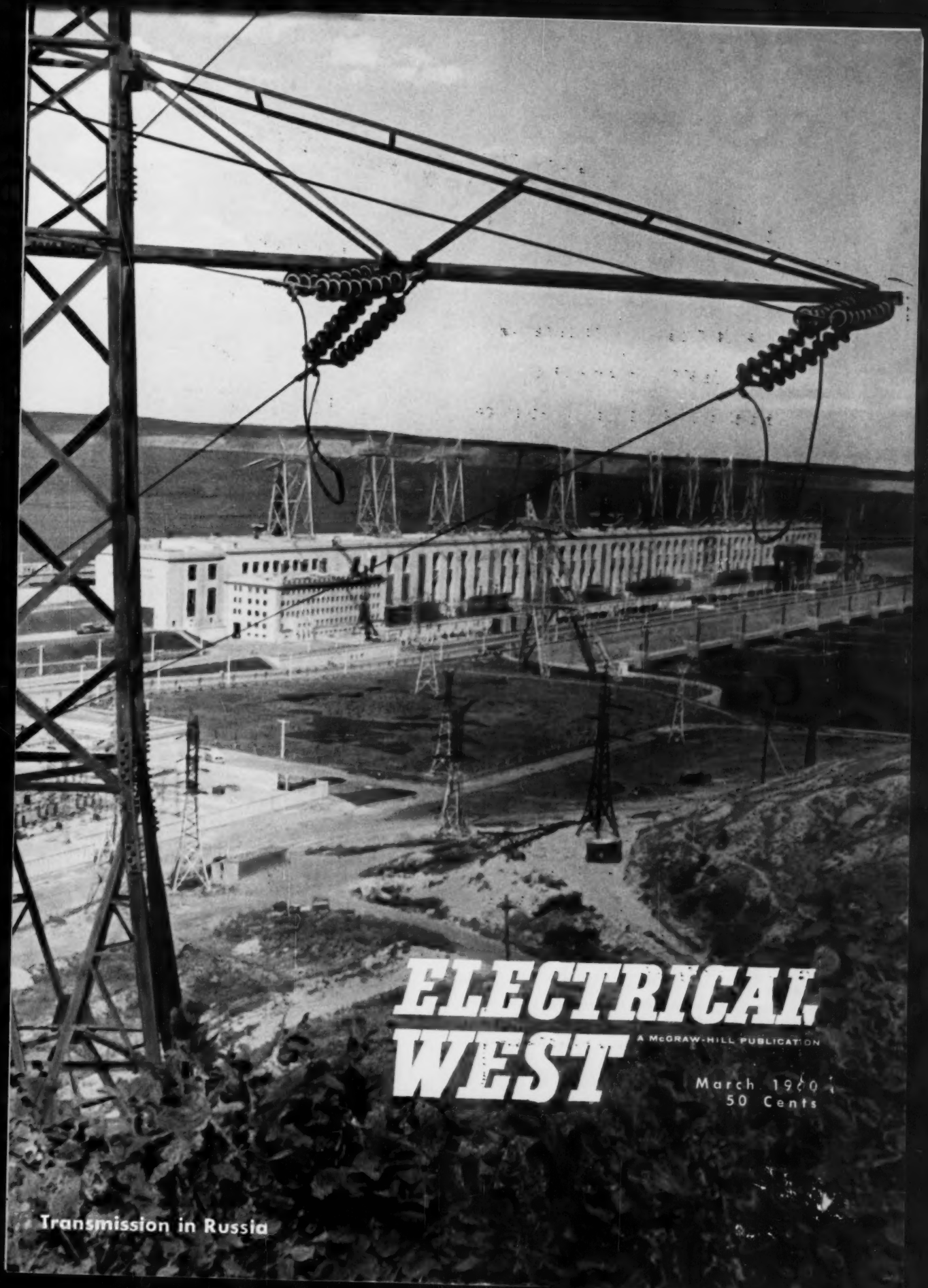
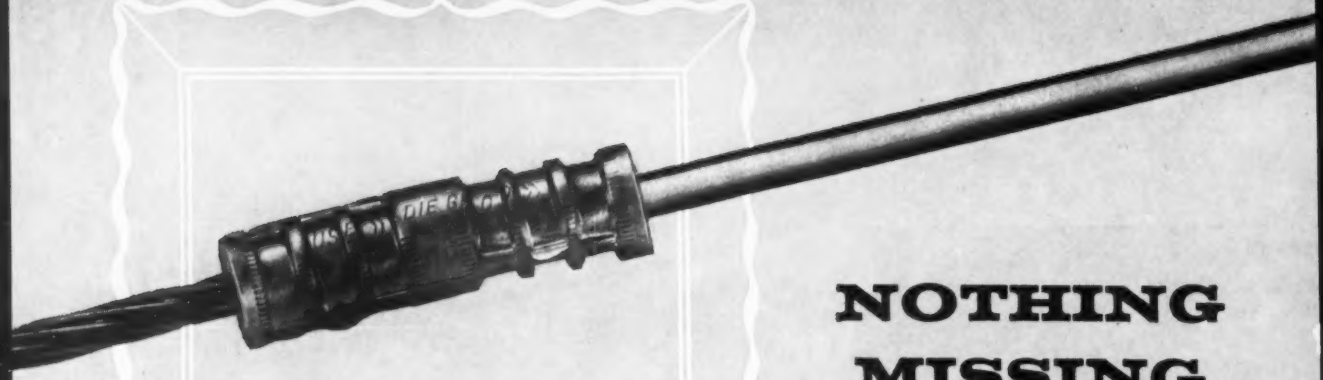


ELECTRICAL WEST

A McGRAW-HILL PUBLICATION

March 1960
50 Cents

Transmission in Russia



NO-MELT INHIBITOR

CLEAR MARKING

BRIGHT COLOR CODING

SNAP CAPS

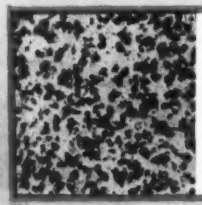
½" & ⅝" DIAMETERS

NOTHING MISSING IN THIS PICTURE

Reliable Aluminum Service *SQUEEZ* Sleeves give you everything — including an inhibitor compounded with granular additives in a no-melt petroleum base. Joints are sealed, excellent contacts induced by the additives are protected. The inhibitor compound has a consistency at temperatures from below zero to over 600°F., there is no melting point.

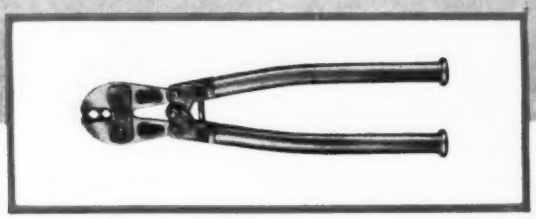
Write for the new Reliable SELECTABLE . . . the quick and easy way to select the sleeves you need for your conductor combinations.

Reliable Aluminum Service *SQUEEZ* Sleeves are unusually well marked, capped and color coded. Name, catalog number and die groove are clear. Inhibitor is in measured amount.



Magnified photo of Reliable's no-melt inhibitor shows *contact inducing* additives suspended in *contact preserving* base that has no melting point.

½" and ⅝" sleeves use standard "X" and "Y" die grooves, or tested substitutes, for compressing.



Reliable Type 70-SS *SQUEEZ* Tool. Tubular Handles with bright orange Vinyl Plastisol insulation.

Reliable ELECTRIC COMPANY • FRANKLIN PARK, ILL.

A Symbol of Integrity Since 1909

editorial views

Advisory Board

Pacific Southwest Region

J. F. Davenport, Executive Vice-President
Southern California Edison Co., Los Angeles
R. H. Cockfield, General Sales Manager
Department of Water & Power, Los Angeles
Joseph Pengilly, Vice-President
Square D Co., Los Angeles
Leonard Hobbs, Vice-President
Smoot-Holman Co., Inglewood
H. C. Gerster, Manager, Western Zone
General Electric Supply Co., Los Angeles
Sidney Hill
Hill Electric Co., Los Angeles
C. M. Smith, Sales Manager
Fluor Corp., Los Angeles
Victor Hartley, Managing Director
PCEA, Los Angeles

Northern California Region

Walter Maytham, Vice-President
Westinghouse Electric Corp., San Francisco
Norman R. Sutherland, President
Pacific Gas & Electric Co., San Francisco
Fred Nicholas
F. M. Nicholas Co., San Francisco
Alfred H. Meyer, President
A. H. Meyer Co., San Francisco
Arthur Dahl, Sales Manager
General Electric Supply Co., San Francisco
Paul Churchill, Regional Manager
Line Material Industries, South San Francisco
George Abbott, President
Abbott Electric Co., San Francisco
Karl Bausch, Chief Electrical Engineer
Bechtel Corp., San Francisco
Walter Bayha
Bayha, Weir & Finato, San Francisco

Intermountain Region

R. D. Moody, Manager
Allis-Chalmers Mfg. Co., Denver
David B. Hyer Jr., President
Southern Colorado Power Co., Pueblo
D. E. Provost
Stearns-Roger Mfg. Co., Denver
Ralph Johnson, Vice-President & General
Manager, Sturgeon Electric Co., Denver
Ken G. Eaton, District Manager
Anaconda Wire & Cable Co., Denver
Howard Peterson
Peterson Co., Denver
W. W. Bowman, Director of Publicity
Utah Power & Light Co., Salt Lake City
A. E. Fleming, District Manager
General Electric Supply Co., Denver

Pacific Northwest Region

Eric Nelson
Shafer & Nelson, Seattle
Charles H. Cutter, Northwest Representative
Federal Pacific Electric Co., Seattle
Ralph James
Northwestern Agencies, Seattle
R. B. Lane, President
Industrial Electric Co., Seattle
Beverly Travis, Consulting Engineer
Seattle
Eugene Starr, Chief Engineer
Bonneville Power Administration, Portland
Thomas W. Delzell, Chairman of Board
Portland General Electric Co., Portland
D. R. McClung, President
Pacific Power & Light Co., Portland
James F. Grieve, Vice-President
C. C. Moore, Engineers, Portland
Max Wood
Schwager-Wood Co., Portland
R. H. Sroufe, Executive Vice-President
Stubbs Electric Co., Portland
Alden F. Krieg, Managing Director
NELPA, Portland
Jack D. Stevens
Puget Sound Utilities Council, Seattle

The Philadelphia Story—The Philadelphia indictments involving major electrical manufacturers on the charge of price collusion cries for a comment on the legal system that brings 12 respected firms and 18 respected men to the bar of justice accused of crime.

Once indicted, they will be tried before a jury of their peers to determine whether or not the law has been broken.

But what about the law itself?

Written before the turn of the century, the Sherman Anti-Trust Law was an effort to legislate the economic proposition that only free competition served the best interests of the consumer. To many, economic beliefs, like certain moral beliefs, are poor subjects for legislation. The prohibition fiasco is an example of a law that made criminals of millions of Americans.

Admitting that this legislation may have been proper at the time, is it in proper context today? Emphatically not. Just as time has made the blue laws ludicrous, there is much evidence that the legal harness fashioned for the free-wheeling business of the '90s is a poor specific today. The regulation of today's business in the form of taxation, government competition and thousands of laws make today's businessman a sorry replica of the elder Rockefeller. Worse yet!

Not content with the law as is, the courts have seen fit to interpret. Thus, in the early days of the law, discussions of price between competitors were unlawful only if they were in restraint of trade. Today, through interpretation, a competitor who sees a competitor's published price and makes his equal has committed "conscious parallel action." The courts of today have accepted this as sufficient evidence of a conspiracy to fix price.

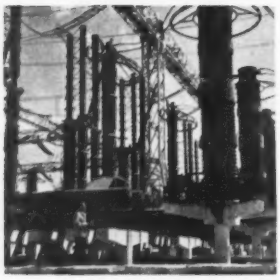
The key question, however, is this. Does the enforcement of the law bring about the results for which the law was designed—the protection of the best interests of the consumer? With unbridled competition, as in no-limit poker, the man with the most money can "buy the pot." This means monopoly. In recent hearings, a representative of the auto industry told a congressional committee that, at will, his company could drive all other companies out of the market place. Is this serving the consumer?

Our industry has many segments where prices have been purposefully equal for many years. But competition has been vigorous in terms of research, product development, application, engineering and service. As a result, there are few industries that can claim such an outstanding record of holding the cost line in the market place as the industry represented by the manufacturers that are now to be judged.

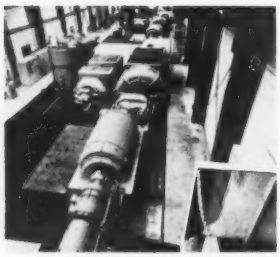
And the industry is policed. Not by measuring action against an archaic law, but by the engineers and purchasing people that have to live with the industry; by the day-to-day competition of trying to meet pay rolls, taxes, "fringe benefits" and a host of other costs that were undreamed of when the basic law was written. And today purchasers have the additional club of foreign competition to wield if they sense that industry prices are too plump.

In a sense, our industry is being tried. It would be wrong to condone flagrant price fixing, but would it not be equally wrong to condone unbridled price competition leading eventually to monopoly? Who has forgotten the effects of the "White Sale"?

The industry should watch the Philadelphia proceedings carefully. To a greater or lesser degree, everyone in the industry has known the facts of similar prices, but we have known *all* the facts and have accepted the system as one that serves the best interests of consumer and industry alike.



Transmission in Russia—72



Remote Controlled Plant—78

Dimmers for New Mexico—84

Shows Boost Sales—67

ELECTRICAL WEST

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S. Established 1887

George C. Tenney, President

C. W. Leihy, Publisher
W. A. Cyr, Consulting Editor
Peggy Boyer, Associate Editor
Miriam Stuart, Editorial Assistant

Jack Robinson, Editor
Marvin Petal, Pacific Southwest Region
Frank Pitman, Intermountain Region
Ray Bloomberg, Pacific Northwest Region

CONTENTS

VOL. 124, NO. 3 MARCH 1960

Sales Climb Again in '59 67
The Kuibyshev-Moscow 500-Kv Line by S. Rokotyan 72
Economics of Centralized Control by G. F. Green and T. D. Stanley 78
Power Cost Time Table 82
N. M. Student Union "Has Everything" by Carl R. Albach 84
How the Codes Apply to Motors and Controls by Tom Hughes 87
Fusing of Ballasts 88

The Cover—Russia's Lenin Volga hydropower station

DEPARTMENTS

Bulletins 113
Construction News 89
Editorials 1
Letters to the Editor 58
Meetings Calendar 56
News 8
News Roundup 6
News of Manufacturers 117
Product News 97
Advertising Index 127, 128

ADVERTISING REPRESENTATIVES

ATLANTA 3: Robert Powell, Rhodes Haverty Bldg.; CHICAGO 11: W. C. McMurray Jr., 520 N. Michigan Ave.; PITTSBURGH 22: Francis X. Roberts, 1111 Henry W. Oliver Bldg.; DENVER 2: John Patten, 1700 Broadway, AL 5-2981; LOS ANGELES 17: Russ Antles, 1125 W. Sixth St., HU 2-5450; NEW YORK 36: Dick Thompson, 500 Fifth Ave.; SAN FRANCISCO 4: T. H. Carmody, Advertising Sales Manager, Don Farris, Dick Alcorn, Bernice Johnston, Advertising Production Manager, 68 Post St., DO 2-4600.

Offices: Boston, Cleveland, Dallas, Detroit, Philadelphia, St. Louis

New News

With this issue ELECTRICAL WEST is enlarging its news section. News features have been taken to the front (this time, pp 8-24). New Products have been moved to the back (p 97). News of manufacturers and personals will be found in their accustomed place, near the end of the magazine. Later will be added a Reader Service Section that you will want to refer to every month.

Electrical West (with which is consolidated The Journal of Electricity), March 1960, Vol. 124, No. 3. Published semimonthly except November when published trimonthly by McGraw-Hill Company of California, James H. McGraw (1860-1948) Founder. Office of publication, 235 N.W. Park Ave., Portland 9, Ore. See panel below for directions regarding subscriptions or change of address.

Executive, editorial, circulation and advertising offices: 68 Post St., San Francisco 4, Calif. Donald C. McGraw, chairman of the board; George C. Tenney, president; John W. Otterson, vice-president; Thomas H. Carmody, secretary and treasurer.

Position and company connection must be indicated on subscription orders. Send to address shown in panel below. Subscription price includes the regular monthly issue, the news letter issue and the November directory issue. United States subscription rate $3 a year, single copies 50c (November directory issue $1); Latin American Republics and Philippine Islands $4 a year; Canada $3.50 a year; all other countries $4 a year. Entered as second class matter, Dec. 17, 1956, at the post office at Portland, Ore., under the act of March 3, 1879. Printed in U. S. A.

Title registered in U. S. Patent Office. © Copyright 1960, McGraw-Hill Company of California. All rights reserved.

SUBSCRIPTIONS: Send subscription correspondence and change of address to Subscription Manager, Electrical West, 68 Post St., San Francisco 4, Calif. Allow 30 days for change of address.

Postmaster: please send notice 3579 to Electrical West, 68 Post St., San Francisco 4, Calif.

SERIES **22**

SERVICE AND MAINTENANCE BODIES

Four Models . . . Four Sizes

COMPARTMENTIZED TO FIT SPECIFIC JOB NEEDS

Which Series 22 Body do you need? Take a look . . . there's a model especially designed for your particular type of service work. The durable, all-steel unit shown above, equipped with an optional overhead rack, is widely used for general service work in all operations. Other models for electric, telephone and gas service have similar compartments fitted with various shelves and bins to meet specific work needs. Result: You get a custom-made body at a mass-produced price . . . plus increased crew efficiency on every job.

Series 22 Body features include flat, 16-gauge compartment tops . . . rust-proof, cadmium-plated door latches . . . bronze hinge rods and nylon bushings . . . key-locking, weathertight doors . . . recessed, slam-action door catches . . . corrugated steel floor.

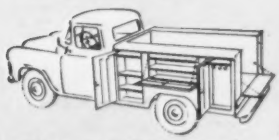
Available in 72", 90" and 104" lengths, equipped with accessories to fit your particular need.

Need more storage space? Any of the four Series 22 models can be furnished with an all-steel superstructure. In addition to any optional items desired, the superstructure is fitted with two full-length shelves and three swivel hooks on each side, a window in the head panel and grab handles at the rear.

Self-Elevating Ladder Assembly

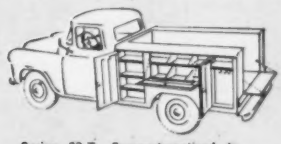
This time-saving assembly with six rubber-covered rollers and four powerful coil springs enables one man to quickly and effortlessly erect a ladder up to 36' in length. The operator lightly pushes the end of the ladder down, and the springs do the lifting. Stowing is equally fast and easy. Ideal for use on 72", 90" and 104" bodies. Includes 28', 30', 32', 34' or 36' two-section extension ladder.

FOR ELECTRIC WORK



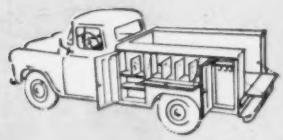
Series 22-E. Designed for service work in any phase of the electric utility industry. Special shelves and bins carry all the equipment and materials needed in the field.

FOR TELEPHONE WORK



Series 22-T. Compartmentized to carry a variety of telephone service tools, parts and materials. Standard arrangement of shelves and bins enables crewmen to quickly find items needed on the job.

FOR GAS WORK



Series 22-G. Two variations of this model are available for carrying either cast or tin meters. Rubber-padded compartments insure the safe storage of fragile parts and instruments.

Plenty of additional bins, shelves and racks carry tools, pipe, fittings, parts and all other equipment needed on routine or emergency service and maintenance calls.

Another reason why
UTILITIES EXPECT MORE FROM

POWERS *American*

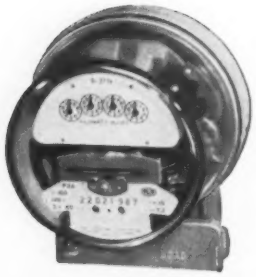
UTILITY BODIES AND EQUIPMENT

McCABE-POWERS BODY COMPANY

5900 No. Broadway ST. LOUIS 15, MO.	625 Cedar Street BERKELEY 10, CALIF.	1461 E. Washington Blvd. LOS ANGELES 21, CALIF.	5525 S.E. 28th Ave. PORTLAND 2, ORE.

DEVELOPED TO MEET YOUR NEEDS...

ACCELERATED



SANGAMO P2 (two element) Meters

accurately measure loads from 18 to 96,000 watts. They give sustained accuracy because of Sangamo's precise factory calibration... skillful design... careful selection of materials... rigid manufacturing control. Slow disk speed, reduced current and potential damping provide greater inherent accuracy in P2 meters.

Now, through new techniques, Sangamo polyphase meters are shipped only five days after your order is received at our Springfield plant. This fast, pacesetter service is made possible through a new order entry system, a new manufacturing scheduling system—using our IBM computer—and new shipping techniques and facilities.

Meters flow from assembly and test lines *to you* without delay. The new million dollar factory warehousing-shipping operation backs up local meter stocks.

Consider this: Five day service on P2 and P3 meters (with demand registers too!) means that you can reduce inventories, and still have the meters *when you need them.* It means you can utilize your crews more effectively, reduce handling, and save storage space. In short, you can cut costs all along the line.

Want to be convinced that our delivery is really fast? Just keep tabs on your next order of Sangamo polyphase meters—the quick delivery time is your proof.

Want to be convinced of the excellence of P2 and P3 meters? Order some and test them. We are sure you will be pleased.

RAPID DELIVERYMAN... SANGAMO STYLE

A computer in the role of deliveryman? Sure... for at Sangamo, our IBM computer plays a key role in getting P2 and P3 meters to you faster. We use it to process orders, to program production, and to determine the number of components necessary to produce the meters you need when you want them. It performs these duties in minutes, not days... lets us telescope the time it takes to process your order, assemble, and ship your meters.

SANGAMO P3 (three element) Meters

give you full revenue from large loads. Full 200 ampere capacity. Modern, small size, single disk round design cuts weight by 50%—volume by 50%—over that of bath-tub-type three-stator meters. Replacement covers for P3 meters save you money, too.

DELIVERY ON POLYPHASE METERS

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

JM60-1

EW

news roundup

SHRINKAGE—The U. S. Chamber of Commerce recently published a chart showing the erosion in the value of the dollar since 1900. Taking the purchasing power of that unit in 1900 as 100¢, the dollar today is now only able to purchase the equivalent of 28.8¢ in goods and services.

Inflation, deficit spending and waste contribute to the inflation that has destroyed nearly three-quarters of the value of savings, pensions and insurance in a short 59 years—not even one lifetime by today's standards.

CONFLICT—Cloud seeding, which utilities have tried as a means of increasing rain and stream flow, may have a contributary effect of causing lightning and forest fires. The National Science Foundation has granted $63,900 to the Forest Service for a study on lightning-caused forest fires, including possible measure to control damage and loss from this source.

At a recent meeting of the Weather Control Research Assn., one report indicated that there was a suspiciously high increase in frequency of lightning strokes during cloud-seeding operations.

SNOW STUDIES—Another project to improve nature's bounty is the California Cooperative Snow Management Research conducted by the state and the U. S. Department of Agriculture's Forest Service. The major objective of this research is to develop test methods of forest and alpine land management that will maintain, increase or delay the yield of high-quality water from the snow zone. For example, patterns of cutting timber apparently have a prominent effect on runoff.

RECRUITING NOTES—According to information released by the National Society of Professional Engineers, the average salary offered to 1959 graduates with B.S. degrees was $490, up $21 from the previous year. Those holding Master and Doctor degrees were offered $554 and $747, respectively.

In 1960 companies are expected to pay about $500 per month for engineering graduates with B.S. degrees. Nontechnical degrees run about $50 a month less than this figure.

Components of new superaccurate gyroscope for more sophisticated inertial guidance systems under development by General Electric include a golfball-size sphere that will rotate at high speed in a vacuum—like a tiny earth—suspended solely by an invisible magnetic field. Engineer Karl F. Schoch, right, describes precision design to James F. Young, recently promoted to general manager of the company's system engineering and planning in the electric utility group. The development makes use of strange behavior of metals at temperatures near absolute zero (minus 460 F)

A post light with automatic sun switch is offered free by Portland General Electric Co. to builders and home owners in its service area who comply with Gold Medallion requirements.

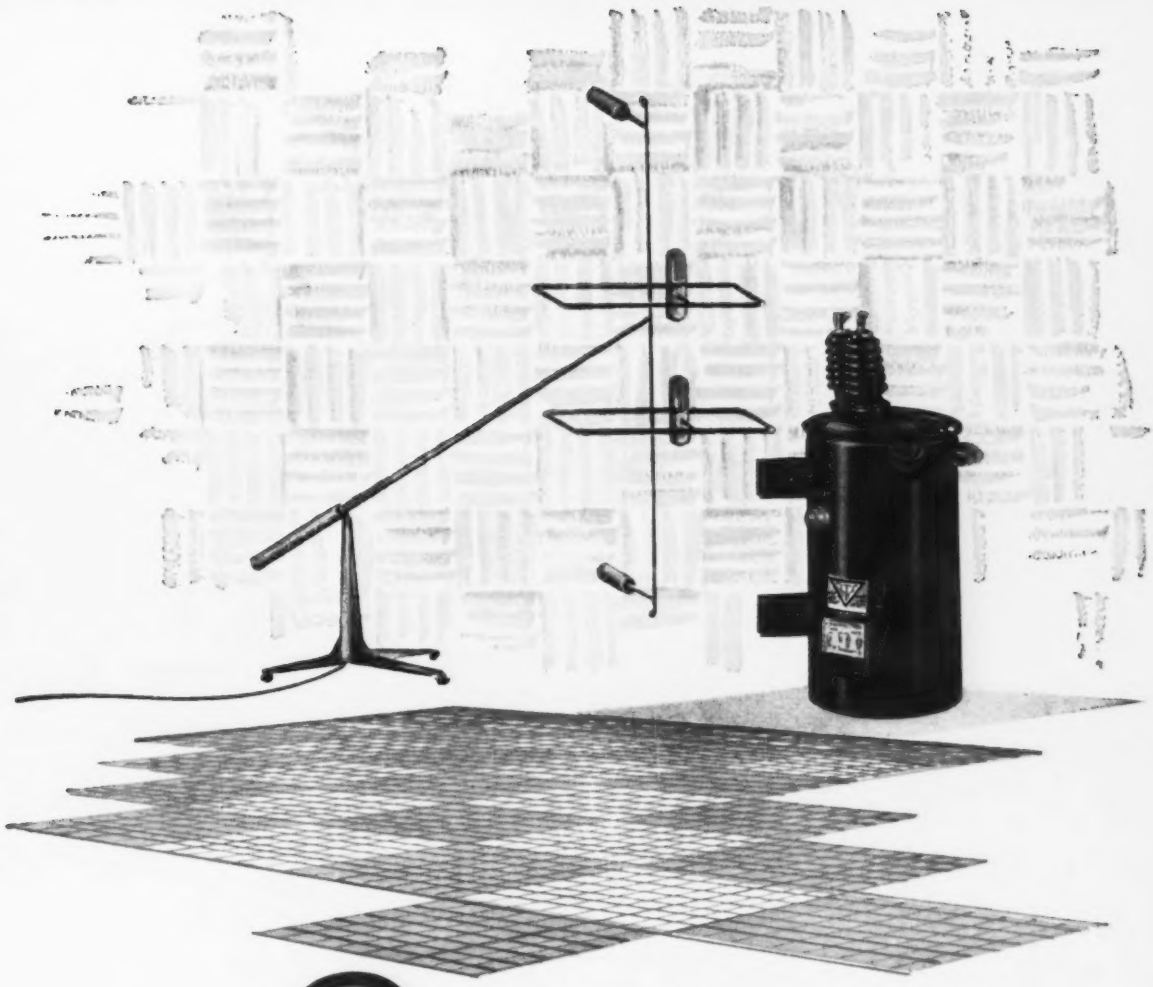
AFTERMATH—The city of Memphis has increased its electric rates 18.5% "to keep the city's new $121 million steam plant operating on a sound financial basis." This steam plant, it will be remembered, was built by the city after President Eisenhower canceled the Dixon-Yates contract in 1955 wherein this power plant would have been built by a combination of investor-owned power companies.

Residential users of Memphis are hit the hardest with the rate increase, some paying as much as 39% more for electricity, according to the report. It was also reported that the Memphis utility would have been faced with a deficit of $6,800,000 this year if the rate increase had not been put into effect.

TAX TIME—Now that it's time to calculate how much we all owe Uncle Sam, the Research Institute Recommendations has come up with a handy table that will help taxpayers measure their deductions against averages, which the tax examiners use as a yardstick. Here they are:

AVERAGE DEDUCTIONS IN VARIOUS BRACKETS

Income Bracket	Charity	Interest	Taxes	Medical	Misc.	Total
$ 5,000-10,000	$ 243	$ 364	$ 321	$ 306	$410	$1,644
$10,001-15,000	428	544	572	516	520	2,580
$15,001-20,000	601	654	804	768	635	3,462
$20,001-25,000	771	753	1,035	982	730	4,181
$25,001-50,000	1,137	1,036	1,468	1,184	980	5,805



QUIET transformers assure satisfied customers.

More-than-ordinary quietness is another outstanding feature of RT&E transformers. Normal noise is hushed, for full transformer life, by a unique core-clamping method that isolates the core and minimizes the transmission of sound vibration to the tank. By this method, operating noise is reduced to a point far below maximum db levels being considered by NEMA as standard for distribution transformers.

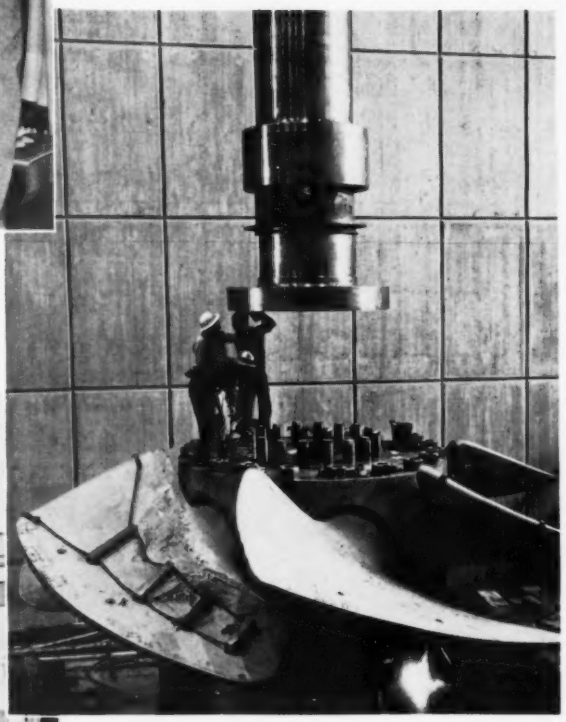
More proof that you buy more than just another transformer when you buy from RT&E.

RT&E CORPORATION
WAUKESHA, WISCONSIN
PORTLAND, OREGON

For phone number of closest representative see advertising index in back of book.

news

Just before signing the Electric Week proclamation, Seattle's Mayor Gordon S. Clinton received a photoelectric-controlled yard light from A. J. Flechsig, president of the Puget Sound Electric League. As the Mayor took hold of the fixture, the office was darkened and the yard light went on automatically



Final inspection on the base of a 90-ton generator shaft to be connected to a turbine runner at Grant County PUD's Priest Rapids Dam. Three of ten generators are now in service under low-head operation. All ten will be on the line by December 1960

The huge pressure vessel at left, which started its journey to Elk River last month, is one of six to be built by Pacific Coast Engineering Co. of Alameda, Calif., for reactor projects throughout the U.S. Allis-Chalmers is building the 22,000-kw reactor

For exceptional service William Jensen, apprentice operator at Washington Water Power's Nine Mile power plant on the Spokane River, receives the U. S. Air Force's highest civilian award from Col. J. M. Vivian, Fairchild base commander. The Exceptional Service Award and Medal was given Jensen for rescuing an airman thrown from a helicopter as it crashed into the Spokane River in March 1959, while searching for a missing girl. Three men died in the crash. Shown at the presentation in Spokane City Hall with Jensen and Col. Vivian are Staff Sergeant James L. Fisher, the rescued airman, and Mayor F. Gaines Sutherland of Spokane

EW

Management

Feather River Power To Sell at Market Value

California's Governor E. G. "Pat" Brown has stated that power from California's Feather River project will be sold at market value to reduce the price of water.

In a follow-up explanation, State Director of Water Resources Harvey O. Banks stated that the reason for the policy was "because of the fact that the project under full operation will consume more power than it will produce, power will be sold at market value in order to reduce the cost of water."

Banks said that the income from sale of power from Oroville Dam will be between $7 and $8 million a year from the time the dam is completed in 1968 to the time when all that power and more besides is needed to lift water over the Tehachapis.

There were some complaints from public power advocates that the policy will "price public preference agencies right out of the picture." However, the view was voiced by one public power supporter that the state has no alternative than to get as much as it can for the power because of the costliness of the project. Governor Brown said that there was little reason to become involved in the public vs private power controversy because over the long run the program will be power deficient.

A power committee has been created with Banks as chairman to arrange for the distribution of surplus power as well as for the acquisition of additional energy when it is needed.

Potshot at Peace River

Canada's liberal leader George Gregory has taken a political potshot at B. C.'s Peace River Power Development plans. Gregory has predicted that Premier Bennett will announce before the next provincial election that the company was unable to meet its commitments and would forfeit its $500,000 performance bonds along with surveys estimated to have cost $5.3 million. On the other side of the coin, Attorney General Robert Bonner announced that PRPD had formally committed itself to develop the potentials of the Peace. The commitment was in a letter dated December 28, which accompanied the formal filing of the company's plans to the Water Rights Comptroller.

City Asks Approval for Bridge Canyon Dam

The city of Los Angeles is riding two horses in an effort to gain FPC approval to build Bridge Canyon Dam on the Colorado River.

Horse No. 1 is the city's proposal to construct a 466-ft-high thin arch concrete dam with an installed capacity of a million kw. This, with Coconino Dam to be built for silt control, and transmission lines would require a $243 million investment.

Horse No. 2 is in the form of HR 9289, introduced by Republican G. P. Lipscomb of the 24th California Congressional District. The Lipscomb Bill calls for federal construction of Bridge Canyon Dam with funds to be advanced by power utilities from California, Arizona and Nevada. Under the Lipscomb Bill, there would be no subsidy from federal taxpayers.

Also pending before the FPC is the State of Arizona's application for a Bridge Canyon permit.

Bouillabaisse

Hearings on the fish phase of the High Mountain Sheep project of the Pacific Northwest Power Co. have been held before the Oregon Water Resources Board. Official and scientific testimony indicated that (1) the High Mountain Sheep Dam was conceptually more desirable because it did not dam the Salmon River—spawning base for 30% of Columbia River salmon; (2) the fish passage facilities planned for the High Mountain Sheep project would be ample and workable for the 3% of Columbia salmon that make the Imnaha home. PNP officials indicated that if rapid state and FPC approval is given the project, High Mountain Sheep can be producing one million of its ultimate two million kw by 1966.

NEWS INDEX

Associations	21
Communications	12
Growth	10
Management	9
Manufacturers-Distributors	117
Market Development	14
Meetings Calendar	56
Nuclear News	11
People	124

PGE Wins Ruling On Joint Pole Use

Marion County Board of Commissioners has ruled in favor of Portland General Electric in a dispute growing out of PGE's refusal to extend a joint pole use agreement with Salem Electric, an REA co-op, into new territory for the co-op.

The board ruled that it is its past and continuing policy to limit power line installation to a single line of poles along a county road or public right-of-way.

PGE had served notice on the county commission and the co-op that it would not extend the joint use agreement into areas when it feels PGE service is adequate. The co-op had indicated that it would seek permission to build a parallel line into a rapidly developing suburban area north of Salem served by PGE.

► **Hawaiian Electric** has been charged with "bad faith" by attorneys for the Campbell Estate who are seeking to block condemnation of 485 acres—a site on which Hawaiian Electric plans to build a nuclear generating station. The site is one carefully surveyed by the Bechtel Corp. and found to be most favorable of any site in the area. After seeking to negotiate a purchase, Hawaiian Electric was forced to start condemnation proceedings.

► **Approximately $34 million will be spent this year** for continuation work on the California Water Development project, mostly in the form of highway and railroad relocation work at the site of the Oroville Dam on the Feather River.

Salmon Spawning Studies

The Walla Walla district office of the Corps of Engineers has disclosed the results of artificial salmon spawning studies, a project that may ultimately give the green light to dams aggregating millions of kw in the Pacific Northwest.

The report covers 1,182 adult salmon, which were confined in the artificial spawning channel. Of this number, 830 came voluntarily up the channel from the Columbia River, automatically trapping themselves in their upstream migration. An additional 352 chinooks were hand-planted in the channel after being trapped at the fish ladder counting station.

Within the channel, screening makes possible an accurate count of all young salmon moving downstream, leaving the artificial spawning beds for the Columbia River. Results to date indicate that 38,000 young salmon have moved downstream with additional downstream migrants continuing until about June. Results of the 1958 test indicated that 788 salmon produced a downstream migration of 39,700 young salmon.

Another advantage of the salmon farm would be to reduce the downstream mortality rate from squaw fish that congregate below a spillway eating as many as 250 young salmon a day. Under a controlled plan the young salmon could be released at night when the squaw fish are not feeding.

► **California Central Valley Reclamation** project earned less from power revenues in 1959 because of drought conditions. Hugh P. Dugan, Sacramento regional director of the Bureau of Reclamation, reported power sales in 1959 grossed $10,158,000, more than $3 million under the gross returns in 1958.

Financial Notes

The following organizations have applied to the FPC for authority to borrow: **Pacific Power & Light,** unsecured promissory notes not to exceed $20 million to be used for temporary financing of the 1960-61 construction program; **Idaho Power Co.,** promissory notes not to exceed $40 million. In a preceding action, the FPC has authorized Idaho Power to issue promissory notes limiting the outstanding aggregate amount to $40,000. **Puget Sound Power & Light,** unsecured promissory notes up to $25 million, which will mature on July 31, 1961.

Additional interest, probably from 10/100-15/100 of a per cent, which was added to the interest rate of the $32 million bond issue to finance the completion of the **Mayfield hydroelectric project,** will cost the city of Tacoma a million dollars over the life of the bond. Cause of the additional interest was the hubbub created in the city in an effort to block the completion of the project. This is probably a fraction of the additional cost caused by the years of delay and three trips to the Supreme Court.

Southern California Edison Co. has sold $30 million of its first and refunding mortgage bonds, series L, due 1985, to a group headed by Blyth & Co. The 25-year bond was awarded on a winning bid of 100.46% for a 5% coupon. The winning bid gave Southern California Edison a borrowing cost of 4.97%.

A group of underwriters is offered $10 million worth of 5⅜% first mortgage bonds, due 1990, and $5 million, 5⅝% sinking fund debentures, due 1985, for the **Washington Water Power Co.** The first mortgage bonds are priced at 101.12% and accrue interest to yield about 5.3% to maturity. The debentures are priced at 101% and accrued interest will yield about 5.55%.

Growth

File on Eden Ridge

Pacific Power & Light Co. has announced the filing of an application to build the $23.6 million Eden Ridge hydroelectric project on the South Fork of the Coquille River in southwestern Oregon. The plan proposes two earth- and rock-fill dams with a single power house having 77,000 kw electrical capability.

PP&L has also investigated coal deposits in the area and maintains that reservoir levels would not interfere with future mining operations if and when the company decides to build a steam-electric plant in the area.

► The FPC has issued a 24-month preliminary permit to Washington Public Power Supply system for a **hydroelectric project on the Hoh River** in Jefferson County, Wash. The proposed project consists of a rock- and earth-filled dam with an installed electrical capacity of 53,600 kw.

► Richvale Irrigation District has filed an application for license for **development on the Middle Feather River.** Four storage reservoirs, Clio, Gold Lake, Grizzly and Nelson Point, are contemplated. Four power plants having a combined capacity of 200,000 kw are involved. Power generated would be sold to Pacific Gas and Electric Co. for distribution in northern California.

► The board of directors of the Public Service Co. of New Mexico has authorized the construction of a **$10.6 million generating unit** to be added to the company's Reeves station five miles north of Albuquerque. Construction will begin in October of this year, with power flowing by July of 1962. The engineering and construction contract has been awarded to Stearns-Roger Mfg. Co. of Denver.

Cedar Falls Expansion

Seattle City Light has retained International Engineering Co. of San Francisco, Calif., to study proposed enlargement of the utility's 30,000-kw Cedar Falls hydroelectric project.

The proposal calls for additional height and greater drawdown, which would mean an additional 50,000 acre-ft of usable storage, and elimination of water loss due to seepage between the crib dam and the masonry dam.

► Seattle City Light and the Seattle City Council found themselves crosswise regarding the **advisibility of placing circuits underground** where they cross the new Seattle freeway. City Light, which has been driven to improve substation appearance constantly to the point of landscaping and architectural treatment, took the position that the whole city could be placed underground, that the people would sit still for a triple power bill. The majority of city improvement groups seem to favor the underground proposal—whatever the cost.

► Colorado Springs Department of Public Utilities was to open bids Feb. 16, for a **44,000-kw steam turbine-generator** for an addition to its south steam plant, it was announced by Ray D. Nixon, director. Bids are to follow on the boilers.

Nuclear News

Direct Conversion

During the past two years increased emphasis has been placed on the process of converting heat directly into electricity (direct conversion). The possibility of using this process with a nuclear reactor is of particular interest. This combination as a long-range application could be very rewarding to the electric utility industry.

The recent announcement by the General Atomic Division of General Dynamics Corp. concerning the production of alternating current from a direct conversion process brings to light the work being done by this organization in this field. The device used to achieve this result was a cesium plasma cell. This cell basically consists of a hot emitter, which releases electrons that travel to a relatively cool collector.

In principle, this action is similar to the operation of an ordinary vacuum tube. Ionized cesium introduced between the emitter and collector increases the rate of electron transfer tremendously and helps to make the attainment of a high over-all efficiency possible. A nuclear fuel element substituted for the emitter, and a collector spaced a short distance away from the fuel with cesium plasma filling the intervening space, makes an ideal arrangement for obtaining electricity directly from nuclear-produced heat.

The recent experiments at General Atomic using the cesium cell have produced sufficient alternating current at a frequency of 100 kc to light a series of small lamps. This cell is capable of producing both alternating and direct current. The mechanism that produces the alternating current is not fully understood as yet. It is true that this high frequency from a practical standpoint is no more usable on a modern transmission system than direct current. A better understanding of the principle involved in this process could lead to the attainment of a more practical frequency.

The achievement of an acceptable efficiency from a device of this nature does require a high fuel temperature (over 3,000 F), which can present a materials problem. Research with nuclear fuel components operating in this temperature range is being carried forward.

The rewards from these endeavors to produce electricity directly from a nuclear reactor are sufficiently large to warrant continued effort in this field. The dream of a power plant without turbines, generators, boilers and condensers and their attendant operating, maintenance and capital costs is worth working for.

This work at General Atomic is partially supported by the eight Western utility companies* comprising the Rocky Mountain Pacific Nuclear Research Group and the San Diego Gas & Electric Co.

Increased Private Control Of Nuclear Fuel Costs

Two recent announcements indicate that increased private industry control over additional components of nuclear fuel cost may be forthcoming. The first release is the disclosure that the Davison Division of W. R. Grace & Co., together with Commonwealth Edison Co., Consolidated Edison Co., Detroit Edison Co., Northern States Power Co. and Yankee Atomic Electric Co. have formed a study group to investigate the technical and economic feasibility of building a privately owned nuclear fuel chemical reprocessing plant.

This plant would be a solvent-extraction unit using a Purex or

* Arizona Public Service; California Electric Power; Pacific Power and Light; Portland General Electric; Public Service of Colorado; Public Service of New Mexico; Utah Power and Light; Washington Water Power.

Two electric light bulbs shine above apparatus used in successful experiments at General Atomic in which heat was directly converted into alternating current electricity. The experiment marked the first such achievement involving significant amounts of alternating current produced without the use of rotating machinery and d-c to a-c converter. A cesium cell converter is used in the demonstration

A new atomic facility is being built for Southwest Atomic Energy Associates, a group of investor-owned utilities, by Atomics International near Los Angeles. To be completed in May, the facility will house a critical assembly machine to study atomic power reactor core configurations and mechanisms

Redox-type process. The AEC has previously stated that it is anxious to have private industry take over the chemical reprocessing of spent nuclear fuels. Successful completion of this $250,000 study venture could mean that this part of the nuclear fuel cycle was on its way toward the same private control status as fuel fabrication.

The AEC in its annual report and its proposed new fuel leasing agreement indicates that the sale of special nuclear material to nuclear plant operators is being considered. The combination of private reprocessing and private ownership of nuclear fuel would permit operators of nuclear plants to reprocess the fuel they produce and reuse it without returning it to the AEC. The economics of doing this are not clear; but the adoption of this arrangement would put essentially all of the components of the nuclear fuel cost except the cost of new nuclear material required under private control.

This method of handling nuclear fuel will probably not occur for a number of years. As the electric utility industry begins to install a large number of nuclear power plants it would be desirable for private industry to have as much control as possible over nuclear fuel costs.

Disposal Sites

The AEC has determined that regional disposal sites for permanent disposal of low level, packaged radioactive waste materials will soon be established on state- or federal-owned land.

Placement of the waste material on government-owned lands, under long-term government control, will assure adequate protection of the public health and safety throughout the period of any potential hazard.

Careful selection of the sites and monotoring procedues will be established to insure that surrounding areas will not be endangered.

The commission does not plan to restrict such sites to federal areas and anticipates that as the atomic energy industry grows state governments may wish to assume responsibility and take over control of sites.

A pricing schedule for use of the land burial facilities is being established and will be published along with the instructions detailing the procedures to be followed in disposal of wastes at the selected sites.

► **Edison Electric Institute** is undertaking a one-year study to evaluate the potential of direct energy conversion as a method for the bulk production of electricity. The Institute has retained Theodore Baumeister, Steven professor of mechanical engineering, Columbia University, to head the study. Organizations interested in submitting information for inclusion in the study are invited to communicate with: Steering Committee, EEI Direct Energy Conversion Research Project, 750 Third Ave., New York 17, N. Y.

Program Criticized

David E. Lilienthal, former chairman of the AEC, recently stated that the American public has been grossly oversold on the commercial possibilities of atomic power plants. He said, "By and large the program (for commercial atomic power plants) has been quite a flop and is not to be taken seriously."

Lilienthal blamed government control and secrecy for the slowdown in commercial development and indicated that we should give the project back to the Henry Fords and Thomas Edisons of today. He said his opinion is "not an antigovernment feeling," but that he believes "the development of individual technology is not the sort of thing best done by a government monopoly of information."

Still another attack came from the U. S. Chamber of Commerce claiming that the government is in unfair competition with the private U. S. atomic industry. Jack Abernathy, chairman of the Chamber's special committee on the subject, cited a score of examples from isotope production to generation of electricity in which industrial activity carried on by the AEC pre-empts private firms of business.

These comments at this time may be influential in congressional hearings on the proper role of national laboratories.

► **A 50,000-w nuclear research reactor,** built by Atomics International, has been installed at the Institute for Nuclear research in West Berlin. This is the fifth reactor the company has installed abroad under the "Atoms-for-Peace" program.

► **The Department of Commerce's** recently published "Facts for Industry," series M38Q-08, indicates that during 1958 shipments to U. S. government agencies, to export and to others, of selected key atomic energy products manufactured in privately owned establishments, totaled $148.9 million. This represents an increase of 55% above the total volume of shipments produced in 1957.

Communications

Southern California Edison has received a CP and is testing closed-circuit TV on a microwave channel for surveillance and reading of switchboard meters. This is the first time that an electric utility has secured permission for a full-width TV microwave channel in the power radio service. Now that the ice is broken, other utilities will certainly wish to take advantage of this powerful communications tool.

Those new FAA radars, which are showing up all over the West, are a potential source of interference to both microwave and, believe it or not, VHF radio. So far the threat appears to be more theoretical than actual, perhaps because of the narrow acceptance band of many of the systems in industrial use. However, intermittent and unexplained bursts of noise might justify a bit of field work to determine if this was the cause. An authentic case of 158-mc interference from a missile tracking radar is on record. This turned out to be due to a malfunction of the radar and the missile men were glad to have it called to their attention.

FCC annual report shows a grand total of 570,000 licensees and 1,700,000 transmitters. Broadcast and TV stations are now outnumbered 165/1 by the other services. Industrial service now has 55,000 stations and 538,000 transmitters, and is still growing rapidly. Electric utility communications engineers would welcome a blanket licensing procedure for their radio system as a whole rather than a multitude of individual licenses that have to be renewed at odd times.

The fate of VHF-TV boosters, which have been used in the West in spite of official frowns from the FCC, may soon be decided. The issue, which once involved only some ingenious people bent on having TV in remote areas at minimum cost and the FCC, has now been widened to include congressmen, TV station operators, the FAA and others who are concerned with the money that the originators of the idea may be saving.

Underwater ITV has proved very useful to the Navy in salvage operations and ocean floor reconnaissance. Similar equipment will no doubt be used to advantage for inspection of underwater structures in hydroelectric developments.

virden Presents the NEW line of SCOTCH PLAID LIGHTING

Beauty *PLUS* Economy...

From Virden, famous for quality, comes a new and separate line of lighting fixtures. Called Scotch Plaid Lighting, here is beauty in design, excellence in workmanship, at a truly economical price! Ideal for tract homes or low-cost housing. Excellent for remodeling, wherever you want high-style at budget prices. See the new Scotch Plaid Lighting line at your nearby Virden distributor. Ask him for your copy of our new, free, full-color catalog. Or mail the coupon below.

See your Virden distributor or mail the coupon today!

VIRDEN LIGHTING

A Division of the John C. Virden Company
Cleveland 3, Ohio

Member American Home Lighting Institute

In Canada, John C. Virden Ltd., Toronto, Ontario

Virden Lighting, Dept. ELW-3
5209 Euclid Avenue
Cleveland 3, Ohio

Please send me your free Scotch Plaid Catalog SP-160.

Find It Fast In The Yellow Pages

Name_____

Address_____

City_____ State_____

For phone number of closest representative see advertising index in back of book.

Market Development

Herb Rosenthal (left), who will design an exhibit for Washington State's electric utilities, stands by as Lee Moran, vice-president of Seattle's Century 21 Exposition, points out a feature on an architect's sketch of the exposition grounds. Utility men at the meeting are, left to right: A. B. Couch, sales manager, Puget Sound Power & Light Co.; Cliff Tyler, commercial manager, Seattle City Light; Ken Billington, secretary of the Washington State PUD Assn. and Bob Jordan of the Pend Oreille Public Utility District

Utilities Join in Fair Exhibit

Twenty electric utilities have agreed to sponsor a joint exhibit in Seattle's Century 21 Exposition, scheduled to open in the spring of 1962. The group is the state's first major industry to participate.

Included are Pacific Power & Light Co., Puget Sound Power & Light Co., Seattle and Tacoma City Light, Washington State Public Utility District Assn. and more than a dozen of its member units.

The group has contracted with Herb Rosenthal, Los Angeles designer, to develop its exhibit theme and design concept. His fee and other costs of the program will be shared by the utilities on a per-customer basis.

The participation in Century 21 Exposition is the first time the industry has united in a cooperative program of this sort, according to Lee Moran, Century 21 vice-president of exhibits and concessions.

Moran said it is too early in the utilities group's program to put a dollar size on it. "Rosenthal's research and studies will be the determining factor," he explained. "The group has discussed exhibits ranging up to $500,000, including the likelihood of housing it in its own building."

► **Tombstone Territory,** Western history based on authentic incidences recorded in the **Tombstone Epitaph,** is being sponsored on TV by **Pacific Gas and Electric Co.** For the rural family, the utility is presenting the Noon Farm News on KGO, including a market report and a weather forecast. Commercials tell uses of electricity on the farm and in the home.

Fair Boosts Sales of Wash and Wear Units

To gage success of its recent Wash'n Wear Fashion Fair at Billings, Montana Power surveyed eight participating distributors on per cent of increase or decrease in sales of electric home laundry equipment. Period taken was Sept. 15-Oct. 15, 1959 and 1958.

Significantly, the eight firms reported 59% increase in sales of automatic washers **with** wash and wear cycle, while only two reported an increase in automatic washers **without** wash and wear cycle—a 5% increase. Four distributors said sales of models without wash and wear were **down** 11%.

In the case of dryers, wash and wear cycle units had a 56% increase. Dryers without wash and wear cycle were up 8.5%, according to two firms, and down 9%, according to two others.

Special Offer Adds Heating Customers

Inland Power & Light Co., Spokane, added 96 residential electric heat installations during a recent promotion campaign, Vincent P. Slatt, manager, reported.

He said campaign results were about 50% above expectations. The new installations amounted to a total connected load of 1,448 kw.

The REA cooperative now has some 600 electric heat users among its 8,200 customers.

Twin Campaign

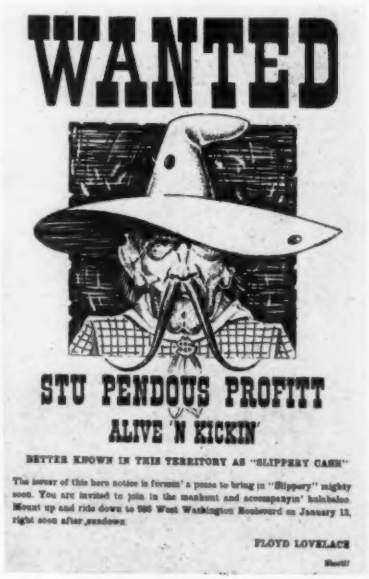
Allowances for wiring installation are being continued by Los Angeles Department of Water & Power through its range and dryer campaign to end April 30.

Details of the promotion (first time the department has run two campaigns simultaneously) were announced at a kick-off dinner called by Floyd Lovelace.

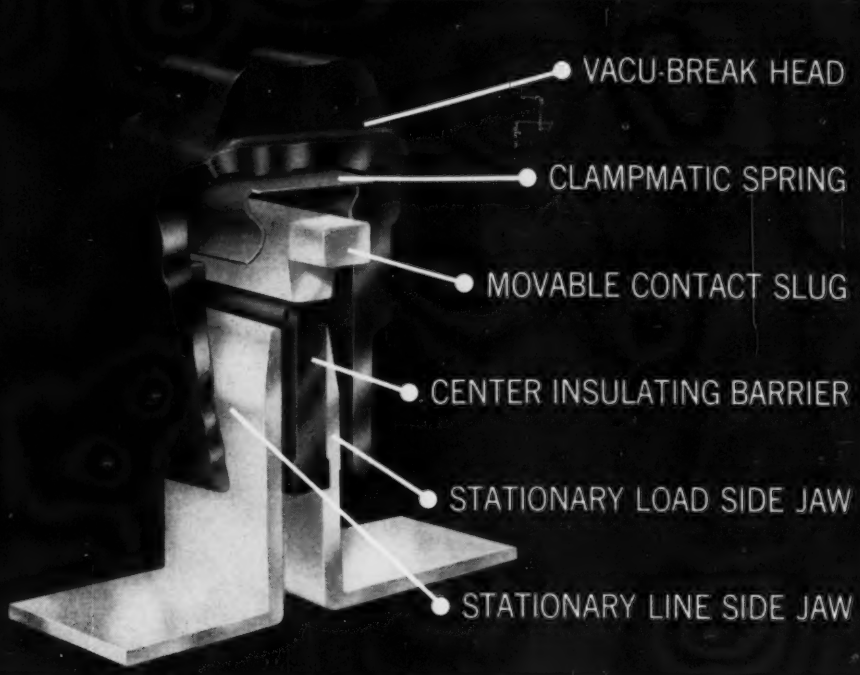
The $35 range wiring reimbursement policy put into effect in October will be continued through April. In addition $25 will be given toward wiring a 230-v dryer or combination washer-dryer. If a range and a 230-v dryer are installed at the same time, the wiring allowance will be $60.

A wire on time plan is also offered, with bi-monthly installments to the department.

Dealer incentives include a cash bonus for selling an electric range requiring wiring and for selling either the 120- or 230-v dryer. Top dealer salesman will receive an all-expense trip to Boulder City and Las Vegas.


WANTED
STU PENDOUS PROFITT
ALIVE 'N KICKIN'
BETTER KNOWN IN THIS TERRITORY AS "SLIPPERY CASH"
The owner of this here notice is formin' a posse to bring in "Slippery" mighty soon. You are invited to join in the manhunt and accompanyin' hullabaloo. Mount up and ride down to 926 West Washington Boulevard on January 13, right soon after sundown.
FLOYD LOVELACE
Sheriff

CLEVER MAILING PIECES are reminding dealers to take part in the range and dryer campaign being conducted by Los Angeles Department of Water & Power through April 30. Sheriff Floyd Lovelace sent out this announcement of the kickoff dinner for dealers and salesmen



THE INSIDE STORY...

Why switches last longer with clamped pressure contact and Vacu-Break arc control

This BullDog Vacu-Break® Switch Head is the reason why Vacu-Break switches stay in action longer.

See how the unique Clampmatic® spring clamps the contact slug firmly between the line and load jaws . . . provides a virtual bolt-tight connection! This clamped pressure contact prevents overheating while in the "on" position—and as the switch moves to "off," the spring speeds the break. Both features mean longer switch life for your customers.

Equally important to longer switch life is the action of the Vacu-Break head. Arc chambers enclose the switching contacts. When contacts are broken under load, arcs are smothered quickly. Pitting and burning are cut to the absolute minimum, thereby minimizing maintenance.

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Michigan. In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N. Y.

For Safety's Sake Buy Vacu-Break

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY

Vacu-Break switch units with clamped pressure contacts are available in BullDog Safety Switches, Switchboards, Vacu-Break Power Panels and Bus Plugs. They cost no more and give your customers the maximum in safety and performance. See your BullDog distributor.

Consult the following Pacific Coast representatives:

Coast Electric & Manufacturing Co.
1733 N. E. Seventh Ave., P. O. Box 7712
Portland 12, Oregon

Safety Switchboard Company
910-89th Avenue
Oakland 21, California

Young Electric & Mfg. Co.
2134 Curtis St.
Denver 2, Colorado

BullDog Elec. Prod. Co. of Los Angeles
2885 E. Washington Blvd.
Los Angeles 23, California

KEEP PACE WITH ELECTRICITY

Growth Seen for Electric Heating

Electric house heating growth in Colorado rural towns and farming areas "should at least triple in 1960," according to Glenn Stukey, retiring president of Colorado Farm Power Council.

Stukey, manager of the Yampa Valley Electric Assn. (REA) at Steamboat Springs, made his prediction in his report to the council's recent annual meeting in Denver.

"There was tremendous expansion last year in electric heating and there's no reason why it won't gain three times or more this year," Stukey said.

Increased effort to promote electric house heating was also urged by E. H. Pemberton, general sales manager for Southern Colorado Power Co. at Pueblo. He said most of the electricity consumed for heating comes during periods of low demand. He said heating demand does not add "appreciably to the peaks and will really bring that load factor up to a respectable figure."

The council decided to conduct a year-round promotion campaign again for electric house heating and lighting. The council's sales promotion committee is preparing a promotional calendar to be distributed to all power suppliers, manufacturers, distributors and dealers of electrical equipment. The calendar is tied in with national, state and local promotional and advertising programs.

Major promotions for the home include laundry during January, February and March; water heaters in February, March, October and November; ranges March, April and May; freezers July, August and September; Operation Snowflake November and December; Medallion Home in September.

Promotions for the farm include water systems in April and May; electric brooding in January and February; ventilation of farm buildings in May and June; electric heat application September, October and November; farm shop equipment November and December.

Edward Gaither of Pueblo, manager of the San Isabel Electric Assn., was elected council president to succeed Stukey. Al J. Letty of Grand Junction, Grand Valley Electric Assn., and Pemberton were elected vice-presidents. Robert Moninger of Denver, Public Service Co. of Colorado, was elected treasurer and N. L. Willard, Denver, Rial Electric Co., was chosen secretary.

Directors elected are Luther Wilkins of Akron, Y-W Rural Electric; Dwain Cox of Montrose, Western Colorado Power Co.; Fred Cummings of Denver, Graybar Electric Co.; Robert Grimm of Denver, G-E Supply Co.; Lee Tipton of Denver, Ward Terry & Co.; James M. Myers of La Junta, Southeast Colorado Power Assn.; and I. W. Patterson of Cortez, Empire Electric Assn.

Glenn Stukey addresses Colorado Council. Edward Gaither, 1960 president, is at right

Builder Adds Yard Light

A Seattle home builder has carried the Live Better Electrically concept one step further by including a photoelectrically controlled yard light in the price of homes he builds.

Seattle City Light helped Contractor Ray Anderson get a good price on yard lights for his Meadowbrook development in Seattle's North End. First of 77 Medallion homes in the project now is nearing completion.

The lights are mounted on ornamental standards in the front yard in such a way as to light sidewalks and stairs as well as the yard. They are turned on automatically at darkness, off at dawn.

► **A high school now under construction** in the Highline school district south of Seattle represents the largest space-heating load ever added to the lines of Seattle City Light. It will total 2,100 kw. With 750 more kw for cooking, water heating and lighting, the school will have a total load of 2,850 kw.

Design Plans for Total Electric Home

Sixteen Total Electric Homes will be designed by five architectural firms under commission by Westinghouse as a part of its 1960 program. Among the firms are A. Quincy Jones and Frederick E. Emmons, Los Angeles, and Bassetti and Morse, Seattle.

According to Chris J. Witting, vice-president in charge of the company's consumer products group, Westinghouse will spend $3 million during 1960 to push its Total Electric Home concept. The new program is 20% larger than the 1959 effort, he said, and will include home plans that have been custom designed for electric living.

To be emphasized is the fact that the Total Electric Home is available today in any price range, style, size or section of the country.

► **NARDA's School of Service Management** will be held this year at San Francisco State College Downtown Campus March 21-23. Registration fee of $75 includes tuition, study materials, housing and meals. Inquiries should be addressed to NARDA Schools of Service Management, Merchandise Mart, Chicago.

► **Don't be a dishwasher . . . buy one** is the theme to be emphasized in PG and E's March advertising. The $20,000 electrical prize drawing promotion sponsored by NCEB ended March 7.

Soft Rubber Boots Prevent Injury to men or machines. A-B pendant stations are available with from 2 to 16 units, plus emergency stop unit in bottom of enclosure.

Allen-Bradley offers the

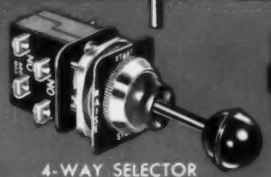
MOST COMPLETE LINE

of oiltight heavy-duty

CONTROL UNITS

The wide selection of Allen-Bradley Bulletin 800T push buttons and control units will enable you to satisfy each and every control station requirement. A-B control units and stations have seals to exclude oils and cutting fluids—contacts cannot become fouled. And *all* control units have the popular A-B double break, silver contacts that assure reliable operation—without maintenance. The rugged construction, flexibility, and generous wiring room of Allen-Bradley's Bulletin 800T line are "bonus" features. To get the best in every way—insist on Allen-Bradley. Send for Publication 6090, today.

ILLUMINATED PUSH BUTTON
Space-saving two-in-one control unit.

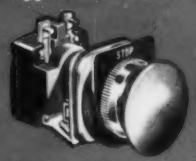


4-WAY SELECTOR SWITCH
Can also be furnished for 2-way operation.

ENCAPSULATED PILOT LIGHT
Transformer type for rugged 6-volt bulb.

PUSH-TO-TEST
Six different color lenses available.

SELECTOR SWITCH
With coin slot operator. Other operators available.



TIME DELAY
Delay adjustable from 0.5 to 5 seconds.

POTENTIOMETER UNIT
Furnished in 2- or 5-watt capacity ratings.

LOCK TYPE
For selector switch or push button operation.

DOUBLE CIRCUIT
Has 2 N.O. or 2 N.C. sets of contacts.

16 UNIT STATION
in die-cast aluminum enclosure. Sheet metal cabinets also available for up to 25 control units.

ALLEN-BRADLEY

Member of NEMA

QUALITY MOTOR CONTROL

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

Yes, Allen-Bradley also makes...

DC Contactors

Here's the only line of DC contactors using the simple solenoid design—with ONE moving part—in all ratings through Size 4. And their double break, silver alloy contacts never need servicing.

BULLETIN 202

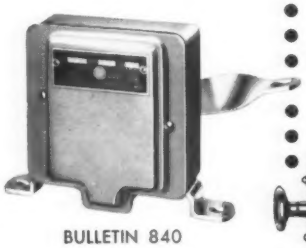
DC Control Relays

These relays are the counterpart of the Bulletin 700 line of AC relays—of which millions are in service. With only ONE moving part—these relays provide the ultimate in long life and reliability. Like the AC line, they have double break, silver contacts that never need maintenance. Made in a variety of types and with up to 8 switching poles.

BULLETIN 200

Float Switches

This versatile line of float switches is available in a wide range of types and enclosures to handle practically every industrial pumping job. They all feature a snap-action switch mechanism for positive operation no matter how slowly the liquid level changes.

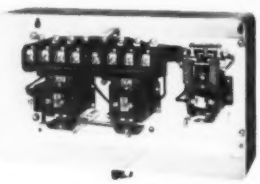


BULLETIN 840

BULLETIN 1209

Loom Switch

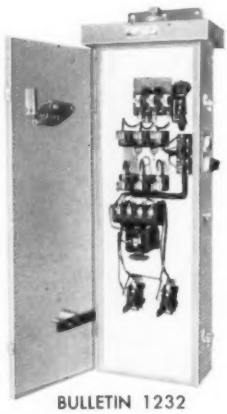
Manual starting switches designed for textile loom service. Design of operating lever makes accidental operation impossible. Lint-tight enclosure eliminates fire hazard.



BULLETIN 1270

Automatic Transfer Switches

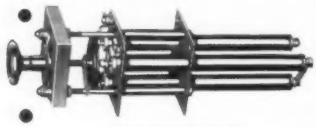
For use where power must be maintained, these panels automatically transfer the load to an auxiliary supply when normal supply fails or falls too low. Transfers automatically when the normal power supply is resumed. Mechanically interlocked.



BULLETIN 1232

Pump Control Panels

Designed for irrigation and oil field pumping applications. Can also be used with outdoor lighting systems. Uses standard A-B Bulletin 709 solenoid starter with manual disconnect switch or circuit breaker in weatherproof enclosure. Available with many optional features.



BULLETIN 410

AC and DC Rheostats

Provide absolutely stepless control over a wide resistance range. Full wattage capacity available at all settings. Sizes to 5400 watts.

4-60-RM

ALLEN-BRADLEY | ***Quality*** **Motor Control**

Member of NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

Sunday Opening Proves Popular

Sunday opening, tried for the first time at the Winter Market in San Francisco, was popular with dealers and brought out a good many new faces. While most manufacturers and distributors of electric appliances have moved their displays from the Merchandise Mart, those still on the fourth floor put on a good show.

Graybar showed the Hotpoint line (ELECTRICAL WEST, Jan., p 72) in temporary space. There for part of Market Week was William C. Wichman, Hotpoint general manager, in the West to speak to dealers and distributors.

Easy's northern California district manager, Jack Tappendorf, drew a crowd with his spiel on the new Combomatic washer-dryer. In a barker costume he played the shell game, gave his pitch in carnival-type patter to prove "it's Easy with the right combination." The 27-in. combination model handles 8 to 10 lb of clothes.

Dave Green of Gregnall Co.'s booth reported good results with a showing of Acme refrigerator-range combinations, Apex cleaners, Blackstone automatic washers and Sub-Zero freezers and combinations. A bar-sink with refrigerator and two electric cooking units was an attention getter in the Acme line.

Campaign Extended

Success of its recent window-painting campaign to promote Norge major appliances at Los Angeles prompted Graybar to allocate an additional $20,000 to continue the effort from Jan. 20 through March 1.

In a $50,000 campaign that ran from Oct. 27 through the end of the year, Graybar offered to paint dealer windows free of charge to advertise the premiums being given away with the purchase of Norge appliances. Laundry soap, bleach, water softener and laundry baskets were given away with the purchase of electric washers, while cookware was offered to buyers of electric ranges.

Sales of the Norge lines picked up about 20% during the course of the promotion, which was backed by newspaper ads.

The free window-painting offer had inspired many dealers to request that they be included in the promotion schedule. Because of the enthusiasm generated, Graybar will extend its window-painting offer to the Webcor promotion. That, too, will be tied to premiums, ranging from dancing lessons at Arthur Murray's to lessons in French, Germany and Italian.

Robert Kolkey, left, vice-president of Dass Construction Co., and Arthur R. Ellis, residential building consultant for San Diego Gas & Electric, look at plot plan for Lake View Estates, which will have 1,680 Medallions

Power Sales Up

The Benton County (Wash.) Public Utility District expects its power sales to be nearly tripled over the next nine years, according to PUD manager Thomas E. Black.

He said peak demand is expected to hit 120,000 kw compared with the present peak demand of 45,000 kw.

Black reported power revenues for the September-October period of this year were up 12% as compared with the same period last year.

Gold Medallion At Orange Show

Feature exhibit at the National Orange Show in San Bernardino, Calif.., April 28-May 8, will be a full-sized Gold Medallion home, co-sponsored by Southern California Edison and California Electric Power Co.

The home was conceived especially for the Orange Show and has been selected for exhibit on a basis of its electrical excellence. Selection of the design was made by a panel of building contractors and real estate brokers, judging competitive entries of members of the American Institute of Building Design.

Largest Medallion Tract

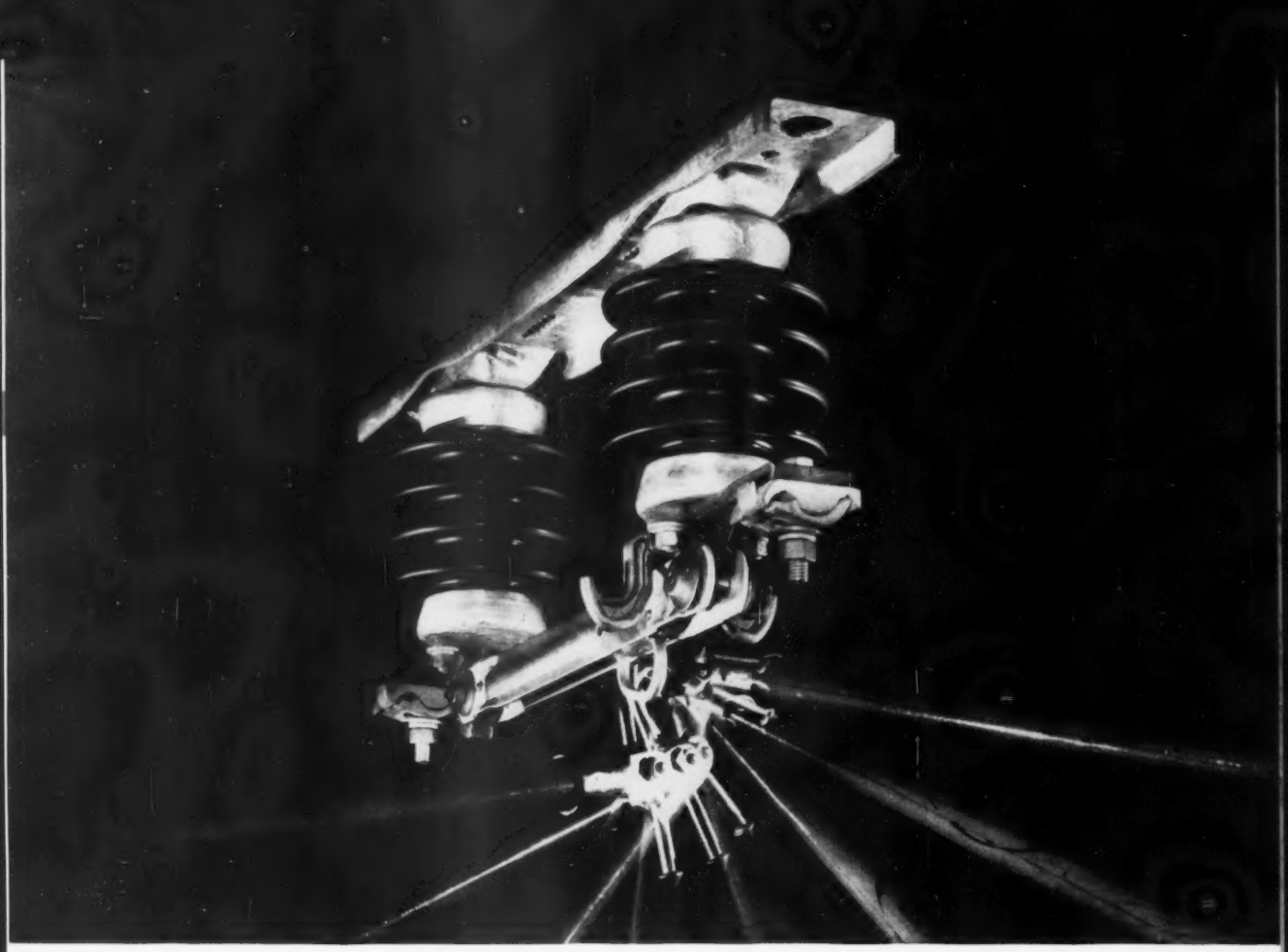
The largest subdivision of medallion homes in southern California, Lake View Estates, was announced last month by San Diego Gas & Electric Co.

Arthur R. Ellis, residential building consultant for the company, said Dass Construction Co., developer of Lake View Estates in La Mesa, will build 1,680 medallion homes.

He reports that more than 200 builders have participated in the medallion home program since it started two years ago; 1,500 medallion homes have been completed with 1,500 to 2,000 more planned for 1960.

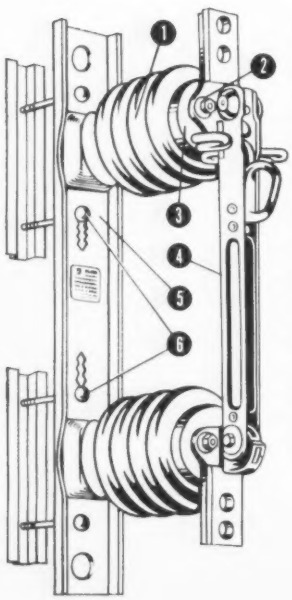
► Five new directors for **NARDA's San Francisco Bay District** Chapter were announced by President **Clarence E. Dulfer.** They are: **Dave Haight,** Palo Alto Hardware; **Jack Dryfuss,** Wisnom's, San Mateo; **Lee H. Searight,** Brueners, Oakland-Sacramento; **W. D. Saxe,** Sterling, San Francisco; **Robert A. Levy,** Dohrman Commercial, San Francisco. Re-elected were **Wesley R. Lackman,** Lackman Bros., **W. J. Lee,** Sherman & Clay, **Carl O. Hagstrom,** General Appliance Co., **Charles Redlick,** Redlick's, all of San Francisco.

► **Gail K. Pinkstaff,** native Oregonian, has been named NARDA's executive vice-president, succeeding **Al Bernsohn.**



From any angle . . .

this S&C Loadbuster Disconnect can be slammed closed without missing.



1. STURDY INSULATOR. Has 5000 inch-lb. torsion strength. Means it can withstand the most severe twisting stresses when blade is closed from the side

2. TWO-BOLT INSULATORS. Two widely spaced bolts on each insulator cap prevent it and the live parts from rotating.

3. INSULATOR CAPS pressed from 12 gauge steel. Will not yield or deform under load.

4. RIGID BLADE won't bend. Heavy embossing and flaring adds strength and rigidity. Blade guides (which also serve as attachment hooks for LOADBUSTER) help steer blade.

5. HUSKY BASE made of 3/16" galvanized steel. Prevents misalignment and extensive distortion when tightening mounting bolts.

6. 4 BOLTS, 2 BACK-UPS for secure distortion-free mounting on double cross arm.

This tough, rugged distribution disconnect won't twist, bend or loosen no matter how hard or from what angle it is slammed shut. To a lineman, who has to close pole mounted disconnects out on a cross arm, this means fast, positive closing. There is no chance of missing the contact or hanging up. Six of the features that help make this possible are pictured at left.

And with LOADBUSTER®, S&C's portable loadbreak tool, and LOADBUSTER DISCONNECTS, you get reliable, low-cost load switching . . . anywhere on your distribution feeders. LOADBUSTER breaks the circuit with no arc, and with no contact burning.

For more information on LOADBUSTER DISCONNECTS please write for Bulletin 721. S&C Electric Company, 4425 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.

S&C ELECTRIC COMPANY

Association Affairs

Hotpoint Manager in San Francisco

Dealers should sell up for profits, W. C. Wichman, G-E vice-president and general manager of Hotpoint, told a meeting of dealers, Graybar personnel and utility men in San Francisco. In-store training is a major point in the Hotpoint merchandising program, he said, and if the retailer organization is kept from dissipating its efforts on low-profit items, it can make more money from the same volume.

Wichman

The industry is not being very smart collectively in its pricing he believes. There is liklihood of some firming, he said in answer to a question, though none was seen last year during the shortages.

Color is a part of the appliance business, he pointed out, and there should be a way to apply it in the field.

Washington Group to Push Electric Living

Puget Sound Power & Light, Seattle City Light and Tacoma City Light are joining in General Electric's new Residential Marketing Development Operation.

In Seattle to talk over plans, Frank Falge, Western regional manager for the G-E operation, said that promotion efforts in the Seattle-Tacoma area will represent more than $230,000 invested by G-E and cooperating electric utilities to encourage electric living.

Changes at HEPCO

C. W. Shafer, for two years Westinghouse sales manager for Honolulu Electrical Products Co., has been promoted to divisional sales manager for both Hotpoint and Westinghouse major appliances.

Gene Dunn, named sales manager of the specialty division, will be assisted by Frank Joy and Cory Burger.

In the Westinghouse major appliance division, Larry Powell will be in charge of builders sales and Gene Lambeth for dealers sales.

In the Hotpoint major appliance division will be Bob Arnott, builders; Steve Hoeffner, dealer contact; John McGowan, commercial sales.

San Diego Contractors

Combining an electrical products showing for contractors and its annual conference, the Contractors Division of the Bureau of Home Appliances of San Diego County was attended by some 421 people Feb. 13 in Balboa Park. Norman Ferguson, president, California Electric Works, chairman of the division, presided over the dinner, at which speakers were Oliver F. Burnett, immediate past president of National Electrical Contractors Assn., and Dr. E. M. Gherman, president, Incandescent Supply Co. of Los Angeles.

The exhibit preceded the dinner and more than 40 manufacturers entered table displays of products used in wiring and electrical construction. The exhibits were under chairmanship of Sam Hall Jr. and the program under Bob Redfield. Coordinator Al McCutcheon handled arrangements.

Oliver Burnett, recently sent as a management representative for the U S. to the International Labor Organization meeting in Geneva, Switzerland, discussed the European labor situation with respect to American industry. He said that the best way to meet the challenge of low labor cost for an industry is to help labor in such countries to raise their living and working standards so that such labor cannot undersell American-made products.

Dr. E. H. Gherman, Norman Ferguson, chairman, and Oliver Burnett, annual meeting speakers

Burnett also predicted an upsurge in electrical contracting work opportunities but pled with the contractors to be sure to do such work at a profit. "It would be too easy to find at the end of a job that all you have done is swapped dollars without doing any good," he said.

Dr. Gherman, a psychologist, gave an interesting and entertaining talk on communications. By demonstrations he showed how easy it is for information to be garbled in going from one person to another and urged sharper attention to communication in business as a means of avoiding misunderstandings and bad practices.

From 2 p.m. to midnight swarms visited the table-top exhibits of the manufacturers

Lighting exposition leaders for the EMEA Electrical Industry Show will be Robert Clubley, G-E Lamp, industrial; James D. Bond, Lighting Dynamics, office; Urban Beh, consulting engineer, general chairman; Bill Jones, Smoot-Holman, schools

EMEA Show Readied At Los Angeles

By planning all preparations and details for a year's time, the 10th biennial Electrical Industry Show of the Electrical Maintenance Engineers Assn. of California, March 23-26, at Shrine Exposition Hall, Los Angeles, promises to be the biggest and most important in its 20-year history. It will be augmented by the first Lighting Exposition and Lighting Conference this year to give the affair special significance in light of the new recommended lighting standards.

The show and conference will open with a big luncheon at the Shrine Hall itself rather than a downtown hotel. The main exposition will be on the main floor of the convention hall with the conference on the lower floor.

A keynote speaker at the luncheon will be Knox Bourne, Los Angeles district vice-president of McGraw-Hill Publishing Co.

The conference will be conducted from five stages where demonstrations of lighting equipment will also be made. Each of the stages will feature lighting for one type of building—schools, commercial, industrial, outdoor and merchandising. Authorities on each type of lighting will be on the program.

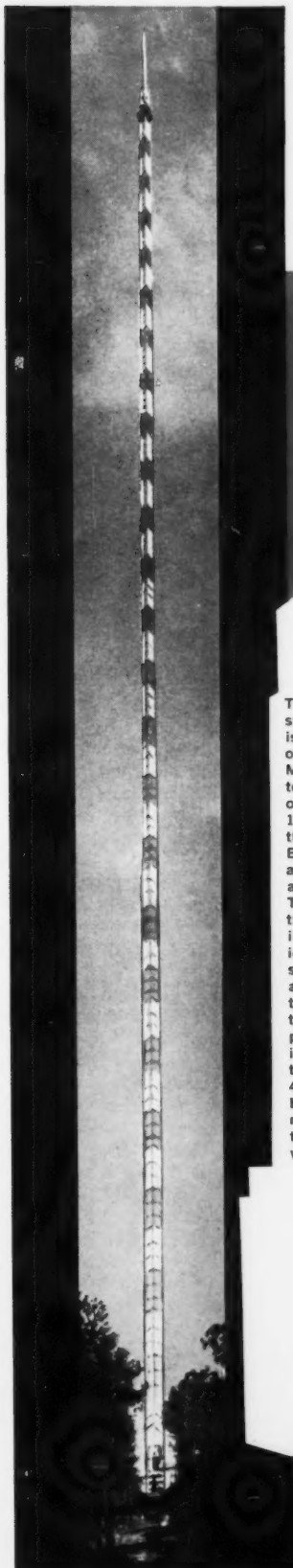
Robert N. Marcum, Hughes Aircraft Co., EMEA president, and Charles H. Hays, Electrical Estimators Inc., past president, are co-chairmen of the show, with Fred J. Tabery as exhibit manager. The lighting exposition and technical conferences are under the chairmanship of Urban Beh, consulting engineer, Newport Beach, assisted by Roy H. Kreyser, Department of Water & Power, Los Angeles, Robert Clubley, General Electric Co. Lamp Division, Jerry Silvers, Globe Illumination Co., Bill F. Jones, Smoot-Holman Co., James D. Bond, Lighting Dynamics, and John A. Kresich, Pacific Division, Steber Mfg. Co. Competitors are working together in the promotional program, which promises to be representative of all makes and products.

Makes Speaking Tour

A. H. "Bill" Gudie, president, Biddle Trade Publishing Co., made a busy speaking tour of the Northwest at the request of wholesale distributors to address meetings of wholesalers' salesmen. While not NAED sponsored, prominent members of that organization arranged the meetings in Seattle, Jan. 18; Spokane, 20th; and Portland, 22d. John Lawton, Graybar Electric, Seattle, and NAED governor, presented the Art Hooper talk from the NAED convention and Gudie told the salesmen, "You need to sell the things you know." Attendance was 220 in Seattle, 85 Spokane and 97 in Portland. Elmer Favro, G-E Supply, Seattle, gave the Jones paper and Lawton Arthur Hooper's "Let's Make Money," the NAED presentation. Jim Hartwig of North Coast Electric presided. In Spokane Maage LaCounte, Columbia Electric, presided and M. T. Watson of G-E Supply was general chairman. Henry Vincent, Wesco, introduced Gudie. In Portland Wes Carlson of Wesco was general chairman and R. W. Field of G-E Supply gave the Jones talk and Lou Stohler of North Coast introduced Gudie.

On his return, stopping in San Francisco, Gudie was asked to talk at Stockton. In Seattle he addressed the Puget Sound Electric League for NAED Day.

At Stockton's National Electric Week dinner, sponsored by San Joaquin Chapter, NECA, Northern California Electrical Bureau and Pacific Gas and Electric, at head table were Walter Lind, PG and E, speaker; R. Wayne Parker, Delta district manager, PG and E, chairman; Glen Bockmon, NECA governor; O. E. Rush, PG and E commercial manager, master of ceremonies; A. H. Gudie, president, Biddle Trade Publishing Co., Los Angeles, featured speaker; and J. E. McCarty, NECA San Joaquin Chapter president



ONLY ONE HIGHEST

BRONCO Certified 66 NEOPRENE

PORTABLE ELECTRICAL CORD AND CABLE

has the HIGHEST NEOPRENE content in the industry at no extra cost

The highest man-made structure in the world is the transmitter tower of WGAN-TV, Portland, Maine. The 1,619 foot tower, put into full-time operation October 30, 1959, is 154 feet higher than the Empire State Building (including its antennas), almost twice as tall as the Eifel Tower, and 9 feet taller than the KSWS-TV tower in Roswell, New Mexico. Of triangular cross-section, just ten feet to a side, the WGAN-TV tower is guyed on all three sides to anchor points 1,200 feet from its base, has an elevator that rises to within 40 feet of its top, is built to withstand 120 m.p.h. winds. The antenna radiates 316,000 watts.

First choice for a durable electrical cable in the construction industry is Bronco 66 Certified. Its outer protecting jacket, containing 67.32% Neoprene and so certified by a Registered Professional Engineer, has the special toughness needed to give exceptionally dependable service to tower builders, tunnel diggers, bridge erectors, and building contractors. TV stations throughout the country are using Bronco 66 on cameras, lights, controls, and for construction. The highest-Neoprene-content jacket keeps Bronco 66 Certified on the job in spite of coastal cold and ocean spray, as well as desert heat, sunlight and ozone. It is engineered to withstand the particular abuse encountered on construction assignments... the elements, oil and grease, abrasion, crushing, and chipping. Bronco 66 Certified is wonderfully flexible, easy to work with; is branded* at exact two foot intervals with complete identifying data in letters that will not rub off. Always specify Bronco 66 Certified and enjoy the long-term economy of top quality.

*Name, type, size, number of conductors, and rated voltage are molded into the jacket by a patented Bronco process—U.S. patent No. 2867001.

SEND FOR NEW FREE CONDENSED CONTROL CABLE DATA FOLDER

BRONCO 66 CERTIFIED 67.32% NEOPRENE

WESTERN INSULATED WIRE COMPANY
Los Angeles 58, California

Bronco Representatives in the West:
CALIFORNIA, Western Insulated Wire Co., (Home Office) 2425 East 30th St., Los Angeles 58; The Curry Co., 305 King St., San Francisco; **NEW MEXICO,** John Carder, Jr. Co., 1624 N. 1st St., Albuquerque; **OREGON,** George M. Roth, 1504 N. W. Johnson, Portland 9; **UTAH,** John Carder, Jr. Co., 1415 So. Main St., Salt Lake City; **WASHINGTON,** Jack H. Stumph, 1000 - 4th Ave., South, Seattle 4.

Initiating the new Contra Costa County Chapter of EMEA are past president E. S. Reichard, Floyd McNeill, new chapter chairman, and past presidents John Singleton and Charlie H. Hays

EMEA Chapter Is Launched

The newest chapter of the Electrical Maintenance Engineers Assn. of California was launched in Contra Costa County Jan. 20 at an enthusiastic gathering of 60 maintenance men, contractors, distributor and manufacturer representatives. Three past presidents of the original organization in Los Angeles were present to give the new chapter blessings.

The new chapter was directed by Floyd McNeill, chief electrician, Western California Canners Inc. of Antioch, who did most of the organization work. Talks were given by Emerson Reichard, retired, former chief electrical engineer for General Petroleum Co., Los Angeles; Jack Singleton, formerly of Lever Bros., Los Angeles, when he was president, now superintendent of the electrical department of Pacific States Steel, Union City near Hayward. Charles Hays, the Electrical Estimators of Los Angeles and San Francisco, and one of the founders, talked of the objectives and bylaws and functions of the organization as developed in Los Angeles County. Pacific Gas and Electric Co. put on a program showing its moving picture of the atomic energy plant at Vallecitos.

McNeill appointed committee chairmen for the new group as follows: Attendance, Manuel Gularte, Antioch School District; Fraternal-Howdy committee, Fred Ralston, Johns-Manville Co.; Membership, Clair Pattison, U.S. Electric Motors, Ken Scofield, Pacific Electric Motor Co., and Don Darby, Westinghouse; Program, Ed Ober, Westinghouse; Welfare committee, Dan Kirby, Western California Canners; Electro-Factus committee, Jerry Moss, Western California Canners; Door committee, Leonard Jebe, Martinez Canners, and Jay Davi, Western California Canners; Raffle committee, John McDonald, Phillips & Edwards Electric Corp., Stan Barton, California Water Co.; Table Top Exhibit committee, Lee Wachs, Electric Corp., Oakland; Program & Property committee, Al Gerue, Western California Canners. Meetings are to be held monthly in the Contra Costa County area.

A second meeting was held in Antioch on Feb. 18. At future meetings McNeill said that the table top exhibits of new products would begin.

NECA - IBEW Meet in Berkeley

An extraordinary meeting of the Northern California Chapter, NECA, Alameda County Branch, in Berkeley Feb. 1, opened the new year with the introduction of new officers, a new manager and a new and friendlier relationship with the executive board of Local 595, IBEW. It was the first such meeting in many years, S. E. Rockwell, business manager of the union, declared, in which the two groups met without having wage negotiations in front of them, and he hoped that more friendly meetings of the kind would be held in the future.

The meeting was in the nature of a report on many of the joint activities of the two — apprenticeship, health and welfare, electrical codes. It was also the occasion for Ernest Kramm, who has been manager of the chapter since 1948, to turn over that post to Matt Gallagher, who for the past year has been assistant manager. Kramm now becomes secretary-treasurer of the District 9, NECA Council.

Ted Buttner, chairman of the Alameda County Branch, presided. George Curran, Red Top Electric Co., newly elected president of the chapter, welcomed the group warmly. Dan Ryan, president of Local 595, also expressed appreciation of the new spirit of the meeting. Tom Ryan, former business manager of Local 302 in Richmond and now manager of the East Bay Bid Depository, spoke briefly of its benefits to both labor and management.

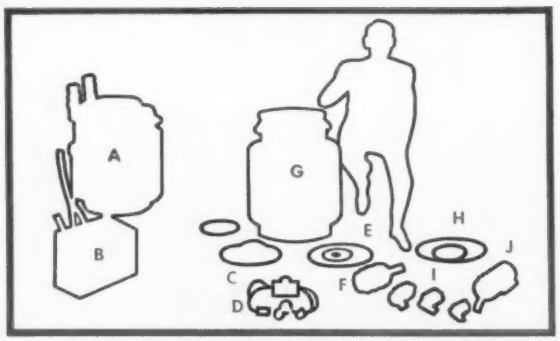
Reports on the apprenticeship committee activity were made by Bill Spalding, Red Top Electric; Harry Kirk, assistant business manager, 595; and Carl Eggers. The program now has 120 apprentices indentured, the highest ever, and is seeking to turn out some 30 to 40 journeymen a year. The health and welfare area program, Kramm said, now makes it possible for a member of the union to work anywhere in northern California and have his benefits credited to his account.

Utah and Idaho

Annual meetings of both the Intermountain Electrical Assn. at Salt Lake City, Feb. 11, and the Snake River Valley Electrical Assn. in Boise, Feb. 13, to commemorate National Electrical Week, will be reported next issue because of shortage of both time and space. Both announce the industry's promotional programs for the year.

ARE YOU TAKING ADVANTAGE OF THE BONUS FEATURES ON GENERAL ELECTRIC DISTRIBUTION TRANSFORMERS?

GENERAL ELECTRIC



(A) NEW G-E DISTRIBUTION TRANSFORMER; (B) Permalex* insulated coils; (C) Melalast* finish cover; (D) breaker with new settings; (E) Nitrile rubber gaskets and overload light; (F) new high-voltage bushing; (G) steel tank; (H) stainless steel clamps; (I) Strenicor terminal clamps; (J) Thyrite* Magne-valve arrester.

On General Electric Distribution Transformers, in Addition to 20% Extra Loadability . . .

Bonus Features Reduce Operation and Maintenance Costs

Get higher loadability with new Permalex insulation– plus outstanding bonus features

* Trademark of General Electric Co.

J. O. SWEENY, Manager—Product Planning, Distribution Transformer Department, and the components of a General Electric 25-kva distribution transformer.

General Electric distribution transformers feature Permalex insulation for 20% added loadability—*plus* important bonus features that can mean day-to-day savings in operation and maintenance. For example:

New Melalast finish on cover prevents costly animal-caused outages, eliminates need for guards or taping.

New breaker settings make extra loadability usable.

Stainless-steel clamps, and Nitrile rubber gaskets simplify maintenance, resist corrosion.

Strenicor terminal clamps virtually eliminate secondary failures.

Thyrite Magne-valve lightning arrester provides optimum protection against lightning surges.

Feature by feature, G-E distribution transformers offer you greater value for your dollar. Ask your G-E Sales Engineer for more details—and the 10 reasons why General Electric is your best transformer buy. Or write for bulletin GEA-6070, to Sect. 431-90, General Electric Co., Schenectady, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Pile on the ice and snow!

Let it sleet. Let it snow. Let the wind blow.

This cable can weather the storm.

Rome's reverse-lay preassembled aerial power cable has a built-in, high-strength messenger for staunch support. Falling branches—even some trees—can be supported by the cable itself!

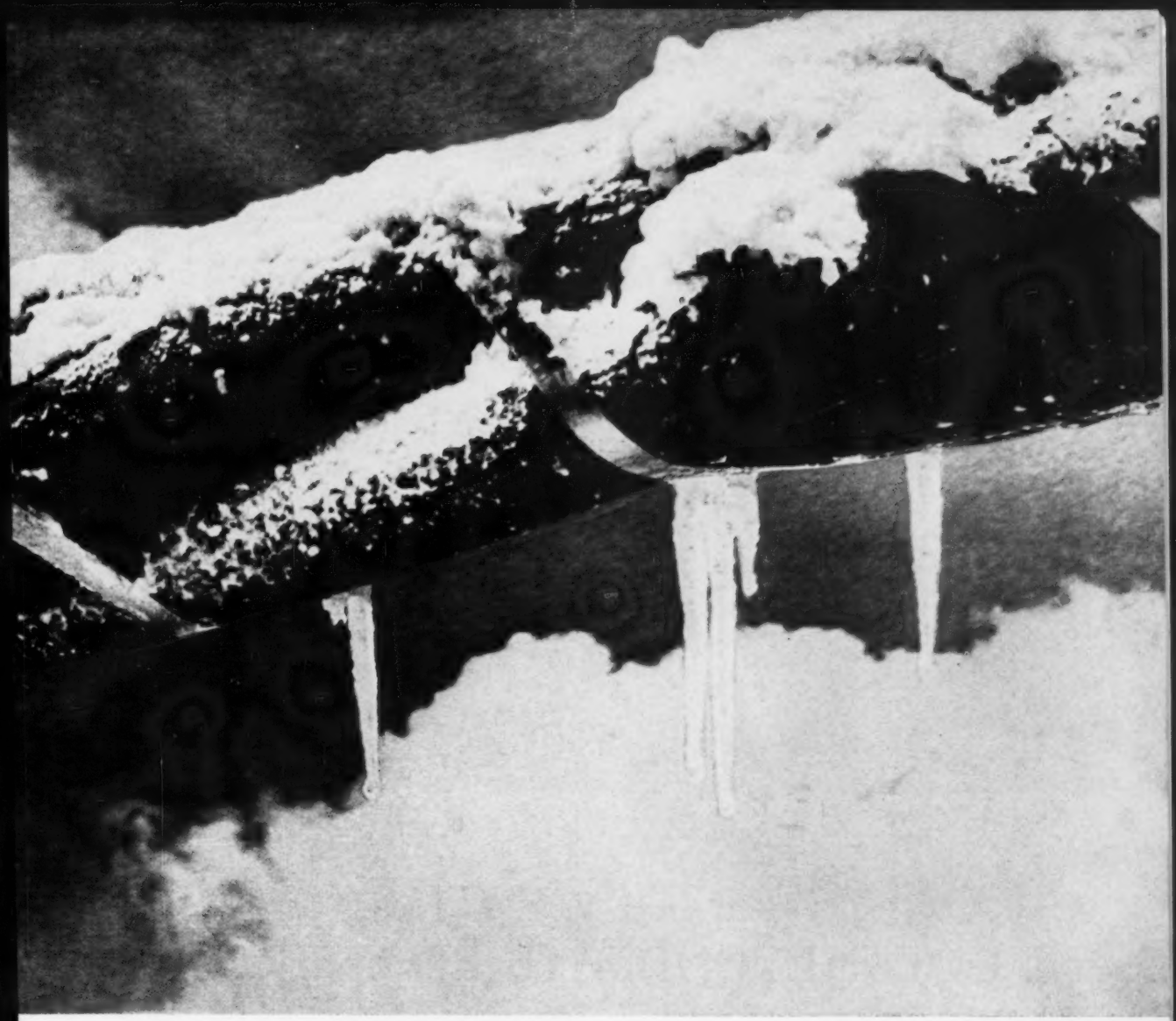
Fewer outages You can use this aerial cable to reduce the chance of outages during storms and high winds. Because it is fully insulated and jacketed for maximum resistance to moisture and tree abrasion, it prevents wet branches from shorting between phases. And it's *safer* for your line crews to handle . . . safer for the public too!

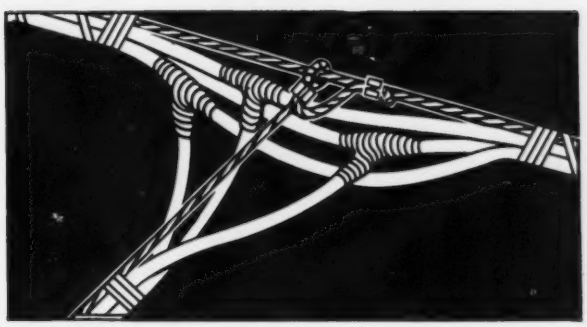
Routing more direct Because it is compact, you can route preassembled aerial cable more directly, with less right of way than is required for open-wire systems. You can run more circuits in less space. Less clearance is required, so you do less tree trimming—initially and periodically!

Wide range of constructions You can get Rome's preassembled aerial power cable in a wide range of constructions, rated up to 15 KV: Rozone (oil-base), Polyethylene, or Rozone A (butyl-base) insulation, Roprene (polychloroprene) or Roseal* (flame-retardant polyethylene) jacketing.

Get all the details from your Rome Cable salesman, or clip and mail the coupon today!

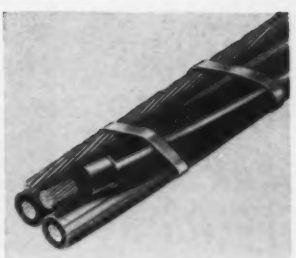
*Trade mark—Patented.





EASE OF TAPPING Long spans sometimes make mid-span tapping necessary. Rome's reverse-lay preassembled aerial cable construction—where the direction of lay of conductors is reversed at regular intervals along the line—permits easy mid-span tapping. The reversed portions provide sufficient slack for taps *anywhere* along the line! This eliminates the necessity of making taps at the pole ends only. Stress is carried entirely by the messenger. Conductors can be untwisted for tapping without cutting—even while the line is hot if conductors are unshielded (5 KV). Your linemen can use wire guards and rubber blankets for safety and make pole-end taps without use of a platform.

BETTER VOLTAGE REGULATION Because of its close geometric spacing as compared with open-wire circuits, aerial cable has a lower reactance. Voltage drop is about half as great as typical crossarm construction and, for a given voltage drop, power can be transmitted twice as far.



ROME CABLE
DIVISION OF **ALCOA**

Department 4-30, Rome, N. Y.

☐ Please send me more information on the above.

Name .....

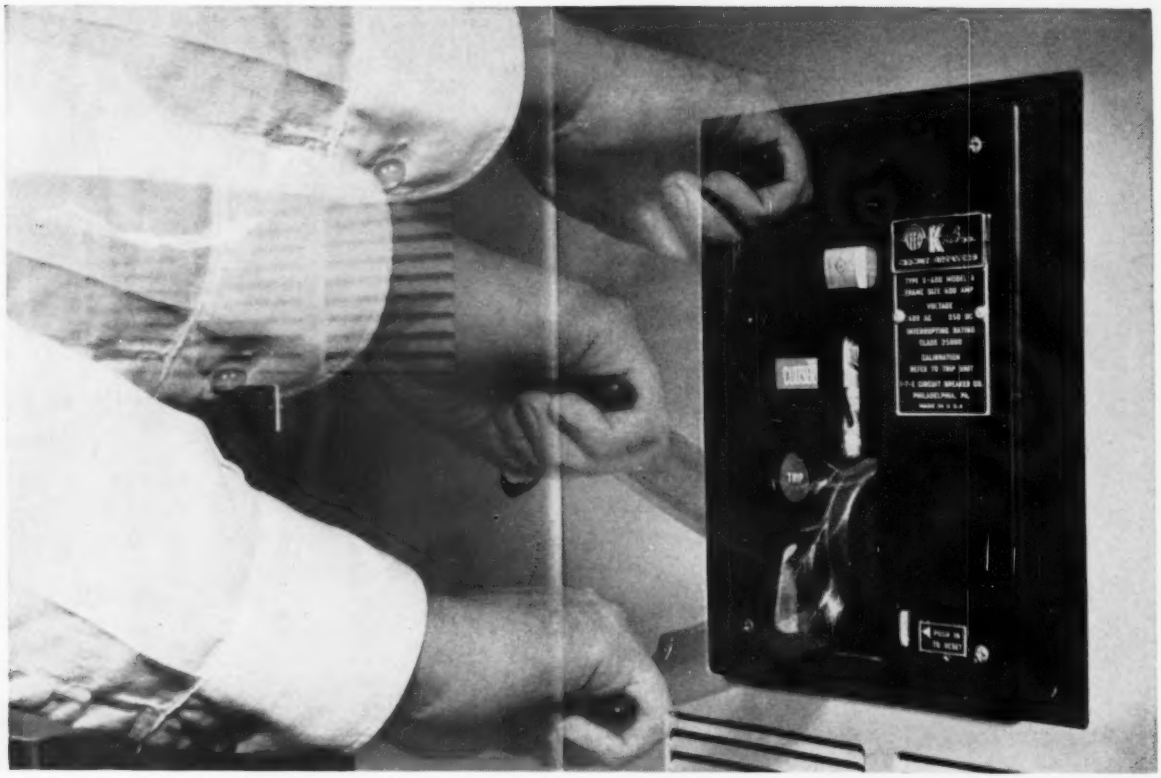
Title .....

Company .....

Street .....

City ..... Zone ..... State .....

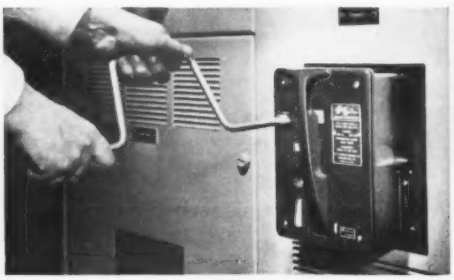
ALCOA
ROME CABLE
DIVISION



I-T-E started a revolution in 1957 when it introduced the completely new K-Line circuit breaker with stored energy closing. Today it is still the most advanced circuit breaker for low voltage switchgear you can buy.

ONLY I-T-E 600 V. SWITCHGEAR GOES BEYOND STORED ENERGY

GIVES YOU ADVANCES NO OTHER GEAR OFFERS



Closed door disconnect. A real safety feature. Operator can rack breaker out to either test or disconnect position without opening door. Prevents cluttered aisles from open doors and protruding breakers. And keeps breakers clean when they are disconnected.

Expanded range trip. I-T-E breakers can grow with your loads. Each trip device has roughly three to four times the range of conventional devices. Saves cost and downtime that replacement would demand. Easy to adjust. Calibrated directly in amperes.

You pay no more. That's right. With all these extra advances I-T-E low voltage switchgear costs no more. Send for detailed descriptive Bulletin 6004-C. I-T-E Circuit Breaker Company, Dept. SW, 1900 Hamilton St., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

For phone number of closest representative see advertising index in back of book.

KRALOY...

FIRST PVC RIGID CONDUIT INSPECTED AND PASSED BY UNDERWRITERS LABORATORIES

• *For direct underground burial or encasing in concrete*

Only KRALOY, yes *only* KRALOY, among all plastic conduits, now carries U-L listing—another first for KRALOY! High impact KRALOY PVC (Polyvinyl Chloride) RIGID CONDUIT... the *lifetime* conduit... the *perfect* conduit... won't rust, won't pit, won't corrode, won't support combustion, is non-magnetic and non-sparking. KRALOY needs no paint, no coating, needs no lining, and its mirror-smooth inside wall makes fishing easier than with any other type of conduit. Add these outstanding features to KRALOY's extreme light weight (see chart below) and you have the *ideal* conduit... ideal for direct burial and slab work. Installation costs can be cut *drastically* with light weight KRALOY PVC RIGID CONDUIT. Consider the dollars to be saved in handling and installing U-L listed KRALOY CONDUIT Cat. No. KE-1058 versus steel, *versus even aluminum conduit:*

KRALOY PVC CONDUIT is sold only through wholesale electrical supply houses.

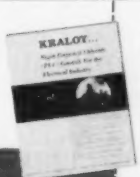
NOTE WEIGHT COMPARISON — KRALOY PVC vs. ALUMINUM vs. STEEL CONDUIT

U.L. required minimum weight per 100 ft. including couplings, lbs.

K-59-29

Trade Size	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	3½"	4"	5"	6"
KRALOY PVC	15.0	20.0	29.0	40.0	47.0	63.0	101.0	131.0	159.0	187.0	253.0	326.0
ALUMINUM	27.4	36.4	53.0	69.6	86.2	115.7	182.5	238.9	287.7	340.0	465.4	612.9
STEEL	79.0	105.0	153.0	201.0	249.0	334.0	527.0	690.0	831.0	982.0	1334.0	1771.0

For complete information on KRALOY PVC CONDUIT and installation directions, mail the coupon or write to Kraloy Plastic Pipe Co., Inc., 402 W. Central Avenue, Santa Ana, Calif., Dept. EWT-3, Los Angeles 22, Calif.



NO CONDUIT REPLACES **KRALOY**

Kraloy Plastic Pipe Co., Inc., Dept. EWT-3
402 W. Central Avenue. Santa Ana, Calif.

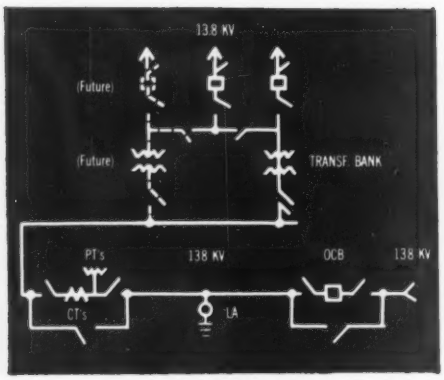
Gentlemen: Please send me your new Brochure on KRALOY PVC CONDUIT which gives complete information and installation directions.

Name_____

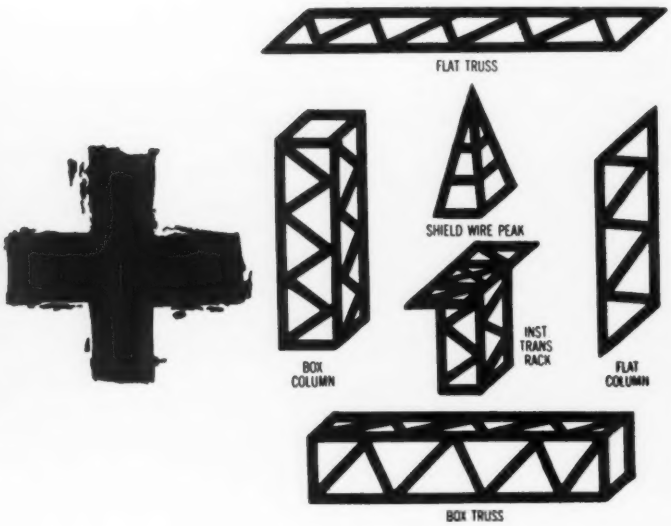
Address_____

City_____ Zone____ State____

For phone number of closest representative see advertising index in back of book.



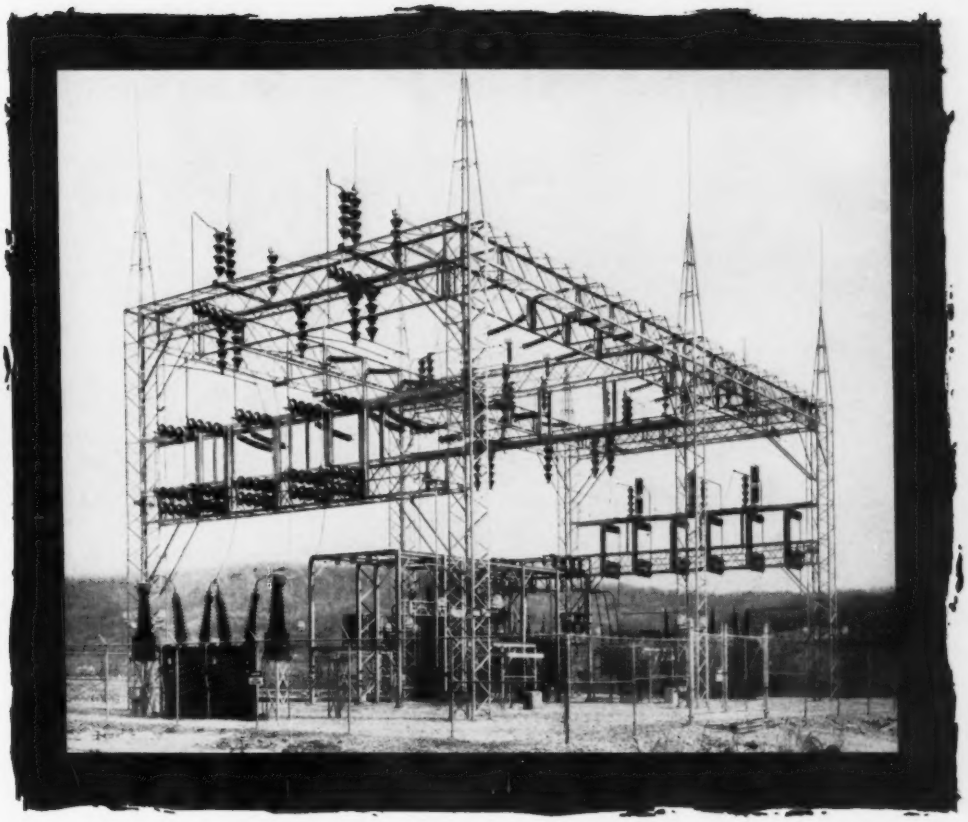
STATION DIAGRAM



NOW... LET WESTINGHOUSE STANDARD STRUCTURAL COMPONENTS REDUCE YOUR OUTDOOR SUBSTATION COSTS

• **A few standardized components** permit an unlimited variety of lower cost station arrangements.

• **Save your design time . . .** just send us the station diagram and Westinghouse will design your substation with standard components.



ADDITIONAL ADVANTAGES:

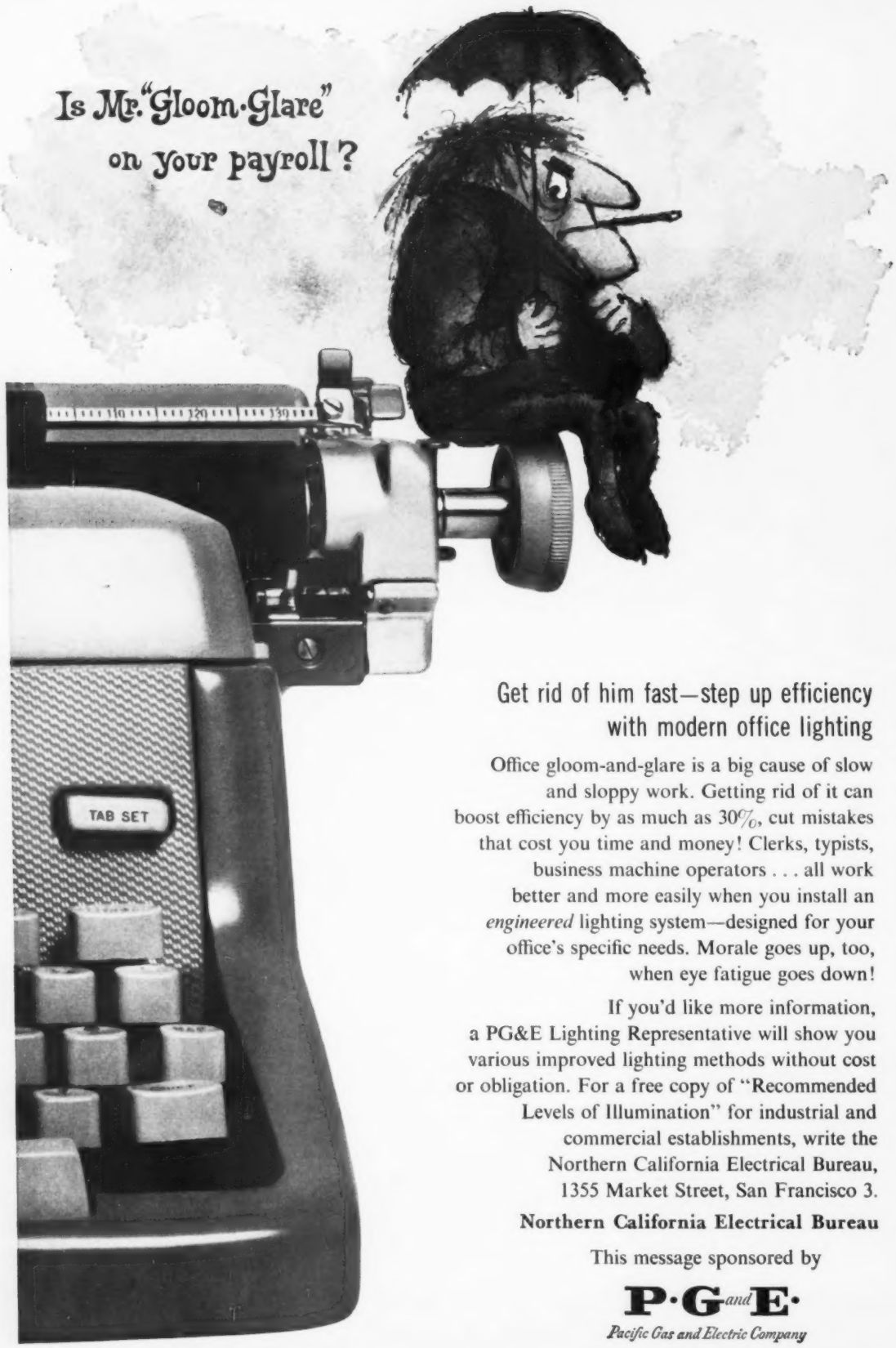
- **Outstanding Product Integration . . .** structure designers coordinate with equipment designers for single-manufacturer responsibility and single-order coordinated delivery.
- **Efficient Use of Steel . . .** maximum strength with minimum weight through proper choice of pre-designed components.
- **Simplified Field Assembly and Erection . . .** all components use interchangeable members—a few bundles of steel instead of many.
- **Uniform Structural Components . . .** give clean, uncluttered appearance to the complete station. Compact design requires minimum plot area.

Investigate this complete Turnkey Plan. Westinghouse assumes full responsibility for the satisfactory operation of the complete substation. Ask your Westinghouse sales engineer for all the facts, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-60992-R

YOU CAN BE SURE...IF IT'S **Westinghouse** WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

For phone number of closest representative see advertising index in back of book.

Is Mr. "Gloom-Glare" on your payroll?



Get rid of him fast—step up efficiency with modern office lighting

Office gloom-and-glare is a big cause of slow and sloppy work. Getting rid of it can boost efficiency by as much as 30%, cut mistakes that cost you time and money! Clerks, typists, business machine operators . . . all work better and more easily when you install an *engineered* lighting system—designed for your office's specific needs. Morale goes up, too, when eye fatigue goes down!

If you'd like more information, a PG&E Lighting Representative will show you various improved lighting methods without cost or obligation. For a free copy of "Recommended Levels of Illumination" for industrial and commercial establishments, write the Northern California Electrical Bureau, 1355 Market Street, San Francisco 3.

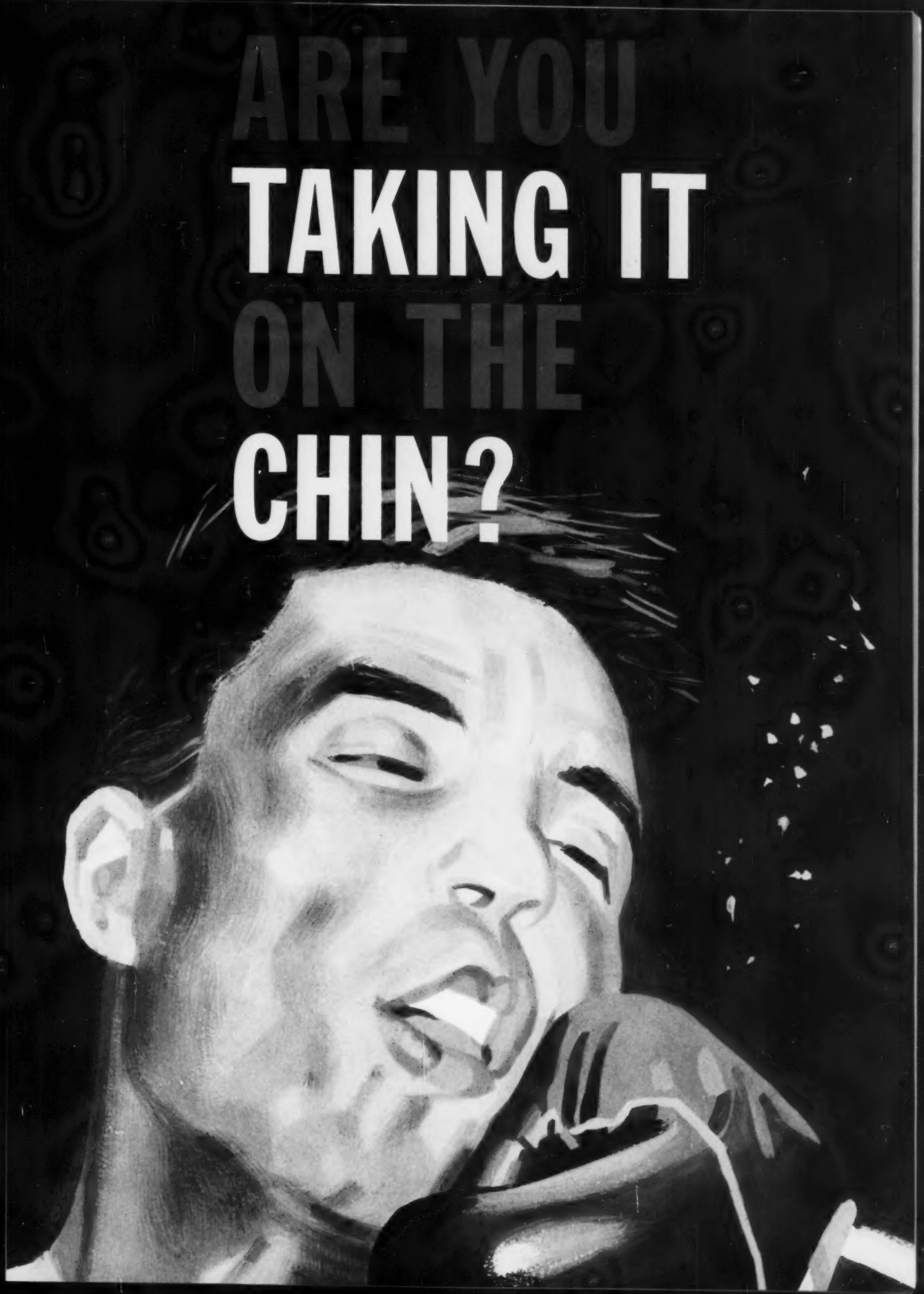
Northern California Electrical Bureau

This message sponsored by

P·G and E·

Pacific Gas and Electric Company

ARE YOU TAKING IT ON THE CHIN?



then STOP buying loss

While most distributors report that today's electrical wholesaling business is good, they also go on to report that making a satisfactory profit is sometimes harder than making a sale.

HOW COME?

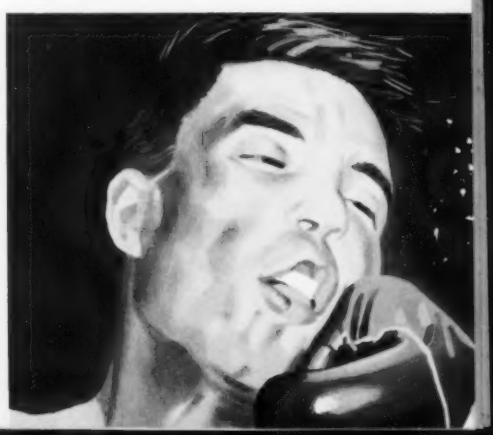
For the answer, let's start at the beginning. Profits start with *buying* . . . when you buy the *right* merchandise—at the *right* price—in the *right* quantity—together with the kind of service and cooperation that insures steady turnover.

CONSIDER THE FOLLOWING FACT ABOUT INVENTORY

When you buy 12 product units at $1.00 each, you have $12 sitting on your shelf. If these products show a 25% gross, your profit when you have sold all twelve units will amount to $3. But the profit is *not* yours until you sell the last 3 units. The first 9 units you sell only returns your *initial* investment—nothing more! If the last 3 units become obsolete, or for any other reason fail to move . . .

YOU HAVE MADE NO PROFIT!

You're taking it on the chin!



and START buying profit

with the Carol® Protected-Profits Inventory Control Plan

That's why distributors everywhere want to know about the "Carol Protected-Profits Inventory Control Plan." This newly developed service is designed to . . .

1. **INSURE MAXIMUM TURNOVER**
2. **ELIMINATE OBSOLESCENCE**
3. **INSURE ADEQUATE INVENTORY TO FILL ALL ORDERS PROMPTLY**
4. **INSURE BALANCED INVENTORIES**
5. **PROTECT YOUR PROFITS!**

SEEM LIKE A LOT?
IT IS A LOT

. . . and here's how you can find out about it! . . . . . .

THIS COUPON MAY BE WORTH A DOLLAR TO YOU.....

Tear this coupon out. Slip it in your wallet or in the drawer of your desk. The next time you see your Carol Representative, make sure he's wearing the badge shown above. If he isn't—just hand him this coupon, and he will pay you $1. Good from March 15 to June 30, 1960.

THIS COUPON IS WORTH MANY DOLLARS TO YOU

CAROL CABLE COMPANY
P.O. Box 260
Pawtucket, R. I.

Please rush me complete information on the "Carol Protected-Profits Inventory Control Plan" and how I may profit from it.

*Name*_____

*Address*_____

*City*_____ *State*_____

STOP taking it on the chin

get in on the— "CAROL PROTECTED-PROFITS INVENTORY CONTROL PLAN"

FIND OUT HOW IT WORKS, TODAY!

When you call for cable—call for Carol!

• PORTABLE CORDS • POWER SUPPLY CABLE, TYPES W AND G • ARC WELDING CABLES
• ASBESTOS TYPES • PLASTIC JACKETED CORDS • CORD SETS • THERMOSTAT WIRES • AND MANY OTHERS

CAROL CABLE COMPANY Division of the Crescent Company, Inc., Pawtucket, R. I.

Whenever linemen climb poles to repair or replace transformers, it costs money in lost revenue and added labor costs. These expenses are reflected in your earnings statement.

Capital for utility financing is naturally attracted to companies having a more favorable record of profits and this is why system dependability is one of the keys to utility financing.

every time he goes up—profits go down

Progressive utility management, seeking methods of assuring system dependability, can specify Moloney Transformers which combine superior design with fine workmanship and materials to provide lower operating and maintenance costs.

Moloney Transformers . . . for More Power To You.

MOLONEY ELECTRIC COMPANY

Transformers for
Utilities, Industry and Electronic Applications

Sales Offices in All Principal Cities
Factories at St. Louis 20, Mo., and Toronto, Ont., Can.

ME80-1

LAPP...FIRST IN LINE POST AND STATION POST INSULATORS

1931 FIRST Line Post Insulator

1931 FIRST Station Post Insulator

1932 FIRST Clamp-Top Line Post

1933 FIRST High-Strength (4,000 lb.) Station Post

1934 FIRST radio-free 66 kv Line Post

1935 FIRST separable mounting studs for Line Post

1936 FIRST Line Posts used for armless transmission

1936 FIRST Station Post for distribution switches

1937 FIRST Extra-High-Strength (8,000 lb.) Station Post

1946 FIRST two-piece Station Posts

1950 FIRST 10,000 lb. Station Post

1954 FIRST Clamp-Top Line Post for horizontal mounting

1954 FIRST Line Post for 115 kv

1955 FIRST Distribution Posts

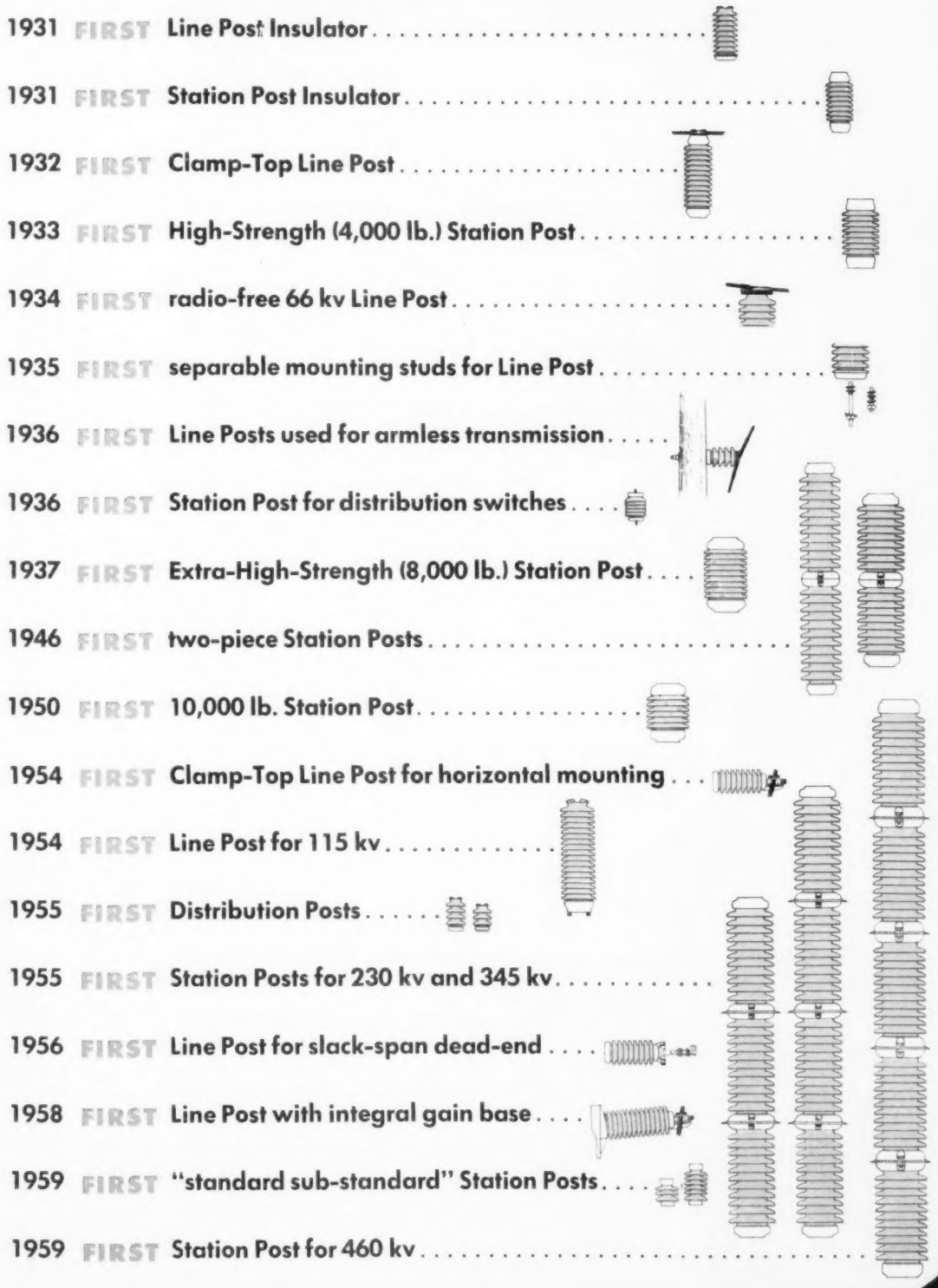
1955 FIRST Station Posts for 230 kv and 345 kv

1956 FIRST Line Post for slack-span dead-end

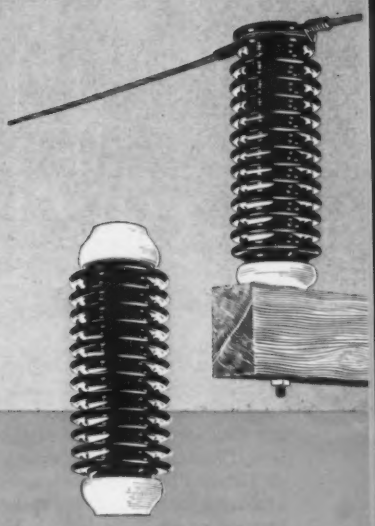
1958 FIRST Line Post with integral gain base

1959 FIRST "standard sub-standard" Station Posts

1959 FIRST Station Post for 460 kv



SUDDENLY OUR BABY'S GROWN UP!



It used to take courage and foresight to specify Lapp Line Post and Station Post Insulators... now it just takes a glance at the record.

You probably take Line Posts and Station Posts for granted. Hard not to, when records show them outperforming pin-type units spectacularly. But when Lapp first introduced its revolutionary idea, in 1931, conservative power companies took a wait-and-see attitude. They waited. Year after year they saw Lapp Posts serve without failure on lines and stations where replacements had been a problem. Finally they began standardizing on this better insulator design.

But it took years. And of course competition sniped away. Between times, they tried to copy Lapp's design, but without Lapp's patiently-acquired skills and techniques in ceramic manufacture. Now that Lapp Posts have been accepted, there is less sniping, more copying—endorsement of the fact that our baby has come of age.

If you're not yet using Line Posts and Station Posts, you ought to know how they cut maintenance and replacement costs. Your logical source is the company that pioneered, proved and perfected them—Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp Line Posts and Station Posts for many uses are shown in the new Lapp Catalog Eight. Write for your copy.

Lapp

CHANCE PACKAGED-PALLETIZED ANCHORS SIMPLIFY ANCHOR HANDLING

Anchor users with mechanical lift trucks or hand pallet trucks can simplify anchor handling by ordering Chance anchors shipped in pallets. Chance 8-Way, Never-Creep or Cross-Plate anchors are now available in individual cartons, in cartons on expendable pallets, and in wire-bound pallet crates. This cuts handling time and expense, saves storage space, improves "warehousekeeping" and simplifies selection and transportation to the job.

available at NO EXTRA COST
for easier, faster storing and transporting

IN COLOR-CODED CARTONS

The color on the carton tells you what size anchor is in it . . . makes it easy to select the anchors you need at a glance, both in the warehouse and the field. There's no haphazard searching for a particular size; cartons store easily, anchors stay put until needed.

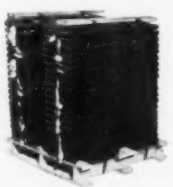
ON EXPENDABLE PALLETS FOR INDOOR STORAGE

The color-coded cartons are held to the pallet—and to each other—by a special adhesive (there are no steel straps to cut), and can be removed from the pallet one-at-a-time. They break away from the stack easily; removing one doesn't disturb or loosen the others. Pallets can be stacked to reduce storage space needed. Minimize handling, too.

IN PALLETIZED WIREBOUND CRATES FOR OUTDOOR STORAGE

For bulk storage outdoors, order Chance anchors in pallet crates. Wirebound crates utilize storage space much better than bundled anchors, cut handling costs, reduce labor and improve storeyard appearance.

Cross-Plate Anchors are also available in bulk strapped to expendable pallets without the crating.



8-WAY NEVER-CREEP CROSS-PLATE

A·B·CHANCE COMPANY

Centralia, Missouri CA60-3

(A. B. Chance Company of Canada, Ltd., Toronto)

REPUBLIC RIGID STEEL CONDUIT

especially made for contractors who like money!

Craftsmanship can be fun again.

Here's conduit that works as conduit ought to work. Fast. Easy. That makes up to a good looking job and puts a dollar in your pocket.

Republic ready-for-the-job conduit is made of soft, ductile steel. Republic's famous continuous weld process heats this super quality steel to exact temperature and immediately forms, welds, and sizes it to a perfect tube. None better in the market.

Thoroughly tested and inspected—including inspection by Underwriters Laboratories, Inc.—it gives you uniformity, ductility, freedom from hard spots, clean, sharp, free-running threads, smooth, clean inside surface, and tight, hot-dipped galvanized surface. It has built-in quality that pays off on the job!

Pick up enough bundles for your next job from your electrical distributor. If you like money, you'll like Republic Rigid Steel Conduit.

GALVITE® RIGID STEEL CONDUIT (Blue Label) is a heavywall, hot-dipped galvanized conduit with a special coat of baked-on lacquer inside and out for greater corrosion-resistance and long life.

ENAMELITE® RIGID STEEL CONDUIT (Red Label) heavywall conduit is protected inside and out with a baked-on coating of tough, wear-resistant enamel for greater protection against moderate corrosive action.

REPUBLIC STEEL
STEEL AND TUBES DIVISION

Cleveland 8, Ohio

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
DEPT. C-9172
216 EAST 131st STREET • CLEVELAND 8, OHIO

I want to learn more about Republic Rigid Steel Conduit. Please send complete information.

Name_____ Title_____

Firm_____

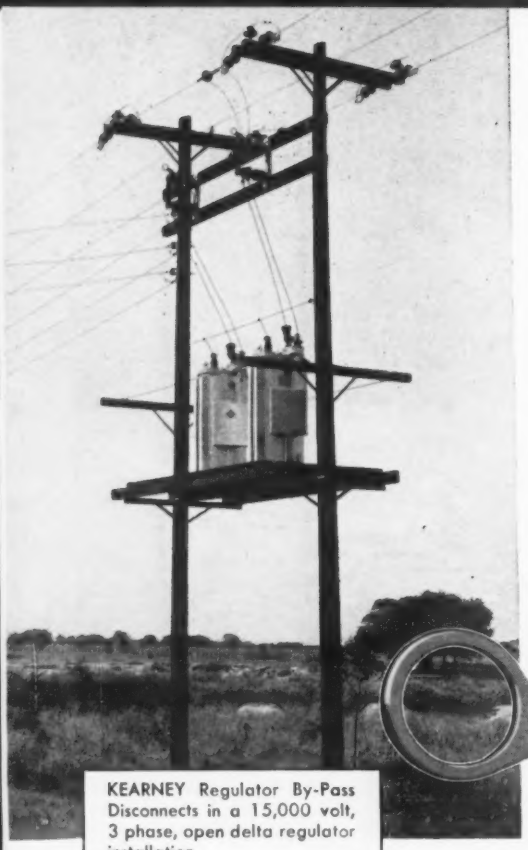
Address_____

City_____ Zone____ State_____

For phone number of closest representative see advertising index in back of book.

Safe performance

of 4 operations in proper sequence assured by KEARNEY *REGULATOR BY-PASS* DISCONNECT



KEARNEY Regulator By-Pass Disconnects in a 15,000 volt, 3 phase, open delta regulator installation.

- **no danger of accidentally dropping load**
- **no hazard from interrupting exciting current**

With the same motion—in the same time—required to open *one* conventional disconnect, the KEARNEY Regulator By-Pass Disconnect:

shunts the line leads to by-pass the regulator—opens both leads to the series winding—safely interrupts the exciting current.

What's more, you realize substantial savings in cost of switches, installation time, supporting structure and leads, because *only one* KEARNEY By-Pass Disconnect is needed for each phase of a regulator installation, compared to *three* single-throw disconnects. And the operator has *maximum safety*, since all switches can be located on the same side . . . visible from one point!

JAMES R. KEARNEY CORPORATION, *General Offices:* **4224-42 Clayton Avenue, St. Louis 10, Missouri**
IN THE WEST: for prompt service, contact Kearney's West Coast Distributor, **Maydwell and Hartzell, Inc.,**
Los Angeles • Seattle • Portland • San Francisco • Spokane • Phoenix.

348

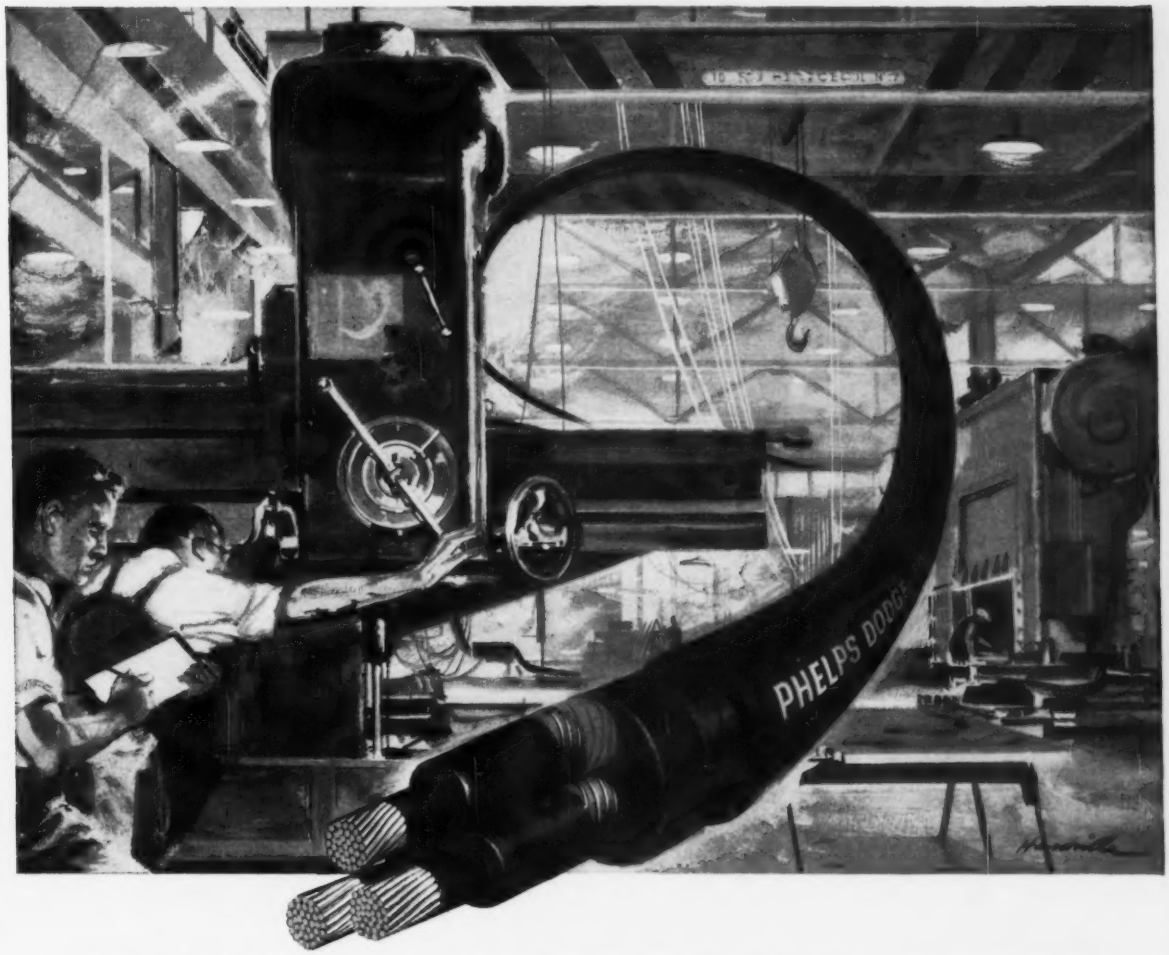
for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify **KEARNEY**

JAMES R. KEARNEY CORPORATION ST. LOUIS MO. GUELPH, ONT.

The Mark of Quality **PRODUCTS**

Plants at: ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IOWA—GUELPH, ONT., CANADA

Steady plant production demands dependable power cable . . .



HABIRITE-HABIRPRENE CABLE gives unexcelled performance!

To help assure uninterrupted production, modern industrial plants require reliable cables for delivering electric power to production lines. The service reliability of Phelps Dodge *Habirite-Habirprene* is unsurpassed by any other rubber insulated neoprene jacketed type RR cable.

Habirite-Habirprene is a combination of specially engineered butyl rubber insulation and neoprene jacket. The overall features of this cable provide greater resistance to heat, oxidation and ozone; improved electrical properties, including superior insulation resistance; higher copper operating temperature; superior flexibility; improved mechanical toughness against damage from installation hazards and extra resistance to corona, an absolute necessity for high-voltage neoprene jacketed cable.

As a general purpose cable, *Habirite-Habirprene* assures the utmost in safety, durability and reliability.

See Your Phelps Dodge Distributor!

PHELPS DODGE COPPER PRODUCTS CORPORATION

SALES OFFICES: Atlanta, Birmingham, Ala., Cambridge, Mass., Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Dayton, Denver, Detroit, Fort Wayne, Greensboro, N.C., Houston, Indianapolis, Jacksonville, Kansas City, Mo., Los Angeles, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N.Y., San Francisco, St. Louis, Seattle, Washington, D.C.

Introducing . . .

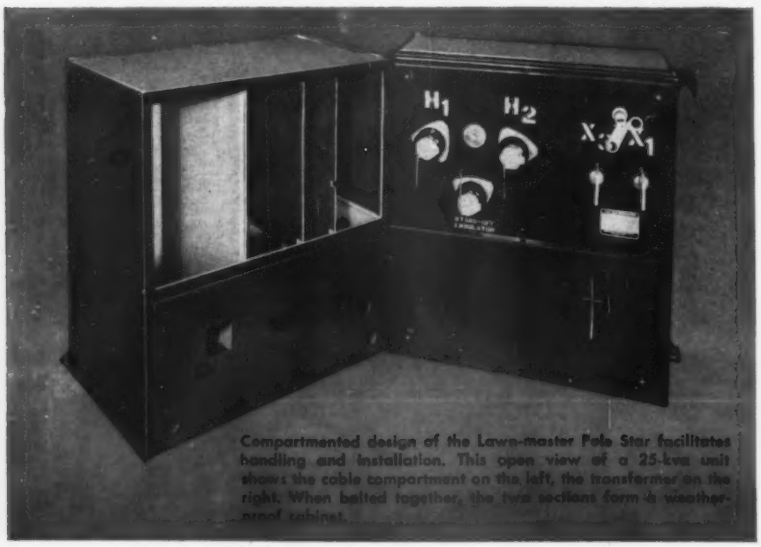
PENNSYLVANIA'S NEW *Lawn-master* POLE STAR

The Surface-mounted Transformer designed with PEOPLE in mind

- **Convenient surface unit for modern, underground distribution systems**
- **Compact, view-enhancing—easy to camouflage with shrubbery, small trees**
- **Easily uprated—each compartment accommodates three different kva ratings**
- **Trouble-free and safe for any location—completely enclosed, with no sharp projections**

Pennsylvania's Lawn-master Pole Star is a transformer designed for "better living" in the fullest possible sense. Specifically intended for use with underground distribution systems, the Lawn-master Pole Star is compact and unobtrusive. Thus, it does not detract from the open vistas created by the elimination of poles and overhead wires.

The Lawn-master Pole Star will provide the continuity of service that homeowners and other power users can expect as a result of underground distribution. All live parts are completely contained in the grounded, weatherproof compartment, thus making the Lawn-master perfectly safe in *any* location, from parking lots to playgrounds. Internally, the Lawn-master features the time-tested Pole Star assembly—with the recently improved "echelon lap" core, which attains new highs in electrical efficiency.



Compartmented design of the Lawn-master Pole Star facilitates handling and installation. This open view of a 25-kva unit shows the cable compartment on the left, the transformer on the right. When bolted together, the two sections form a weatherproof cabinet.

Compartmented design simplifies the handling and installation of Lawn-master Pole Stars. If desired, the cable compartment alone can be installed and then the transformer can be added when service is required. Each compartment accommodates three different kva ratings, so that future expansion is easily accomplished.

Available ratings include all standard sizes from 25 through 167 kva, single phase, and 75 through 500 kva, three phase—15 kv and below. Optional equipment includes transfer switches, standoff insulators and lightning arrester mounting brackets.

For additional information on the Lawn-master Pole Star — the transformer designed with *your customers* in mind—contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

McGRAW-EDISON

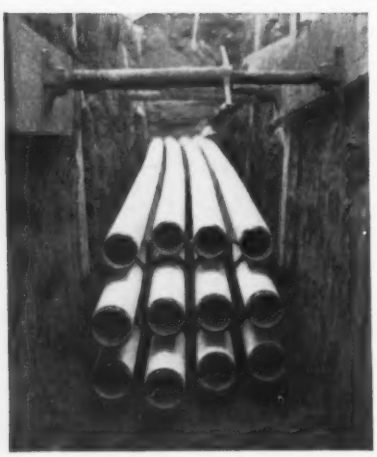
PENNSYLVANIA DISTRIBUTION TRANSFORMERS

Even the 167-kva Lawn-master is easily hidden by shrubbery or small trees. The tank "corrugations" that serve as cooling chambers are less likely to appeal to rope-wielding young cowboys than are conventional radiators. In the larger photograph, compartment doors are open.

Get peak cable protection ***at lowest dollar cost***

Transite Ducts can be laid directly in trench without concrete envelope. Or if ductbank is to be concrete enclosed—thinner walled Transite Duct may be used. In all other respects both heavy-wall and thin-wall Transite Ducts are identical.

Transite Ducts save on the job and after!



No other duct material gives you so many installation and in-service economies

In every way, Transite® Ducts are the most efficient electrical ducts you can install. And—when assembled with J-M's Plastic Coupling—their cost is remarkably low!

One reason for this economy is in installation. Strong, lightweight, long—Transite lengths are easy to handle and install . . . Your men set the ducts in place easily, join them tightly in seconds. Transite's smooth bore is free of burrs and obstructions. Thus, long cable pulls are easily accomplished with no damage to cable sheathing.

You see another reason for Transite's economy in performance. Once in service, Transite's unusually high rate of heat dissipation means cables run cooler, last longer. Transite also confines arc damage . . . cannot burn, smoke or fume. It won't generate explosive or toxic gases. If arcing does occur, Transite Ducts won't sag or adhere to cable.

Let us send the Transite Duct brochure EL-29A. Write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

JOHNS-MANVILLE JOHNS MANVILLE JM PRODUCTS

For phone number of closest representative see advertising index in back of book.

ALLIS-CHALMERS

Originators of 5/8% Step Regulators

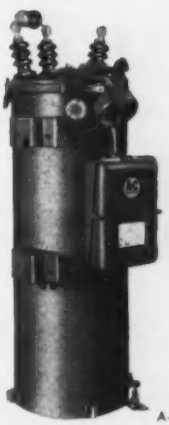
Hang up the "climbers"!

New JFR regulators offer safe, ground-level adjustment

It's standard with Allis-Chalmers! Position indicator drag hands adjust from the ground at the remote control panel. Saves poles, ends risky pole climbing and makes recording of operation range practical. At the push of a button, indicator *drag hands* are reset on large, easy-to-read face with reflecting numbers and indicator hand.

There's much more for you in this all-new design. It's the most advanced regulator on the market today. New sight indicator gives you fast check of oil level. Newly designed cover, with hidden bushing mounting studs, cuts maintenance. JFR's now lower, lighter . . . slashes transportation, handling and installation charges. Ask your nearby A-C office for new JFR bulletin 21B7977E or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

- External by-pass arrester
- Obstruction-free cover
- Electrical resettable position indicator
- Oil sight gauge
- Feather-Touch control



A-1216

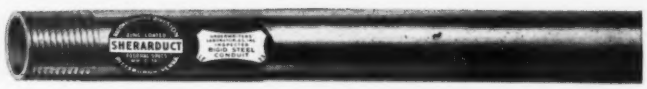
Feather-Touch is an Allis-Chalmers trademark.

For phone number of closest representative see advertising index in back of book.

GET YOUR CONDUIT FROM NATIONAL ELECTRIC

4 BASIC TYPES READILY AVAILABLE IN ALL STANDARD SIZES

SHERARDUCT



Hot-dip galvanizing cannot equal Sherarduct, which is coated with the MVC-1 formula. It's virtually impervious to corrosion, and a special process normalizes the metal to permit *easy bending with no peeling or flaking.*

XDUCT

A superior bright steel conduit with galvanized threads. Outside surface has a coating of electrolytically pure zinc to increase resistance to both corrosion and flaking. Clear hard enamel interior makes fishing easy.

NE ALUMINUM

National's aluminum conduit is an easily installed, corrosion resistant conduit with a permanent attractive appearance. Color-coded thread protectors provide complete thread protection as well as ease in storing and selecting sizes.

EMT

EMT XDUCT Jr. Electrogalvanized exterior with a special formula silicone base clear enamel on the interior to facilitate fishing. Will not flatten, bends readily into the job.

Also available are electrically approved Wrought Iron Conduit, Black Enamel Conduit and Flexsteel, (flexible steel conduit) . . . For additional information write to: *National Electric Division, H. K. Porter Company, Inc., Porter Building, Pittsburgh 19, Pa.*

NATIONAL ELECTRIC DIVISION PORTER **H. K. PORTER COMPANY, INC.**

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION, PEERLESS ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO, S. A.; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

ALLIS-CHALMERS

Extra years of capacitor life

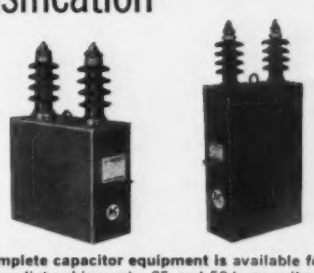
through "extra-low" drying and degasification

Why take the trouble to extract air and moisture with high vacuums? This is to guarantee that you get the greatest return from your Allis-Chalmers capacitor dollar!

Better vacuum processing — a carefully controlled combination of heat and extremely high vacuum — means better penetration of the *Chlorextol* insulating liquid into the packs. Insulating paper losses and heating are reduced, electrical strength is gained. Thorough degassing increases voltage level at which corona starts. It all adds up to a big, built-in margin of safety for severe overvoltages and high ambient temperature . . . for *extra* years of capacitor life.

For more capacitor facts, call, wire or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin. A-1220

Chlorextol is an Allis-Chalmers trademark.



Complete capacitor equipment is available for immediate shipment—25 and 50-kvar units—2400 through 7960 volts. Includes racks, voltage and current controls, other accessories.

For phone number of closest representative see advertising index in back of book.

General Electric Fluorescent Lamps SAVE YOUR CUSTOMERS MONEY

Take initial cost for example:

NEW G-E POWER GROOVE LAMPS CAN SAVE CUSTOMERS $15 TO $85 PER LAMP!

General Electric's Power Groove* Lamp is the most powerful, most popular high intensity fluorescent you can buy. Because it *delivers* more light, users can have brighter plants, offices, stores, even outdoor lighting *while using fewer lamps and fixtures.*

Thus they can save, on initial cost, $15 to $85 per lamp over previous fluorescent types, depending on the installation. It's all because of the grooves in the tube which bend the arc stream and lengthen it to create extra light.

G-E Power Groove Lamps are a product of the same General Electric Lamp research that has improved *every* G-E Fluorescent Lamp—whether it's the slimline, high output, or one of General Electric's two new 40-watt lamps.

WHICH G-E MONEY SAVER LAMP IS THE BEST BUY? There's one that will solve any lighting problem. And General Electric's published record of performance leadership is your assurance that, if they use G-E Lamps exclusively, your customers' lighting systems stay up-to-date automatically. For more information call your G-E Lamp supplier or write: General Electric Co., Large Lamp Dept. C-010, Nela Park, Cleveland 12, Ohio.

*General Electric trademark for its non-circular cross section fluorescent lamp

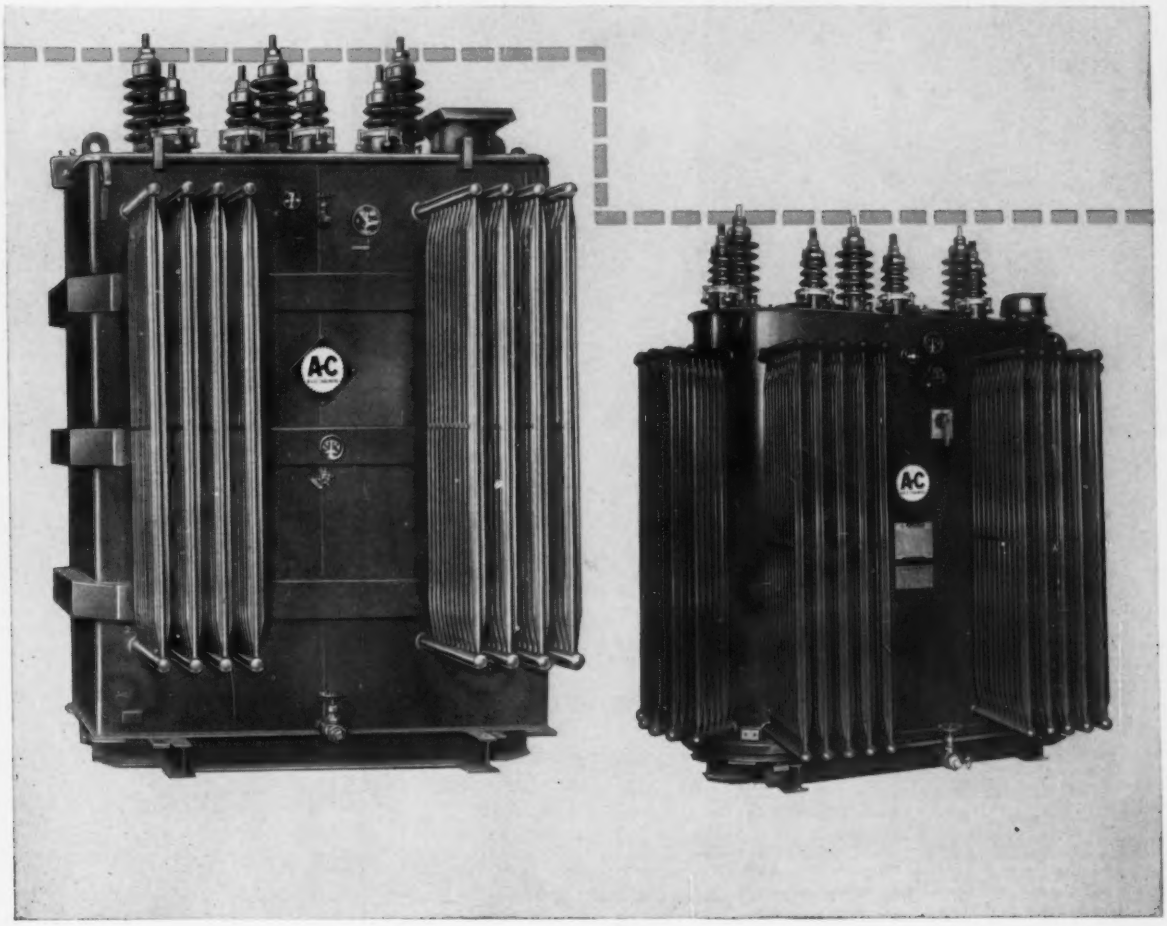
Progress Is Our Most Important Product

GENERAL ELECTRIC

General Electric . . . where bright ideas become better lamps

For phone number of closest representative see advertising index in back of book.

ALLIS-CHALMERS



New Allis-Chalmers small power transformers

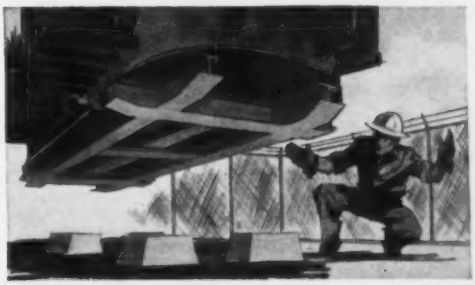
are easier to install because they're 30% lower, lighter too!

Goodbye to building high-cost foundations — engaging extra-heavy-duty handling equipment — all to install "small" power transformers.

All new — these lighter, lower units by Allis-Chalmers bed down on a thinner pad, low-cost piers or concrete planks. Handling is simplified by the weight-saving design. (The 34.5-kv, 3750-kva transformer, for example, has had its weight reduced by 8000 lb.)

Easier servicing is another basic advantage of this new design that also reduces losses, exciting current and noise level. The unit is reinforced from the inside, offering a smooth, clean appearance — no disfiguring, dirt-gathering external bracing.

Get the complete story from your nearby Allis-Chalmers office or write ***Allis-Chalmers,*** *Power Equipment Division, Milwaukee 1, Wisconsin.* A-1237



New base design permits mounting these new A-C power units on smaller foundation structures. This newest transformer also offers grouped instrument arrangement for easier reading, and self-resetting mechanical relief device.

For phone number of closest representative see advertising index in back of book.

Note how ordinary EMT split early in pressure test while induction welded CIRTUBE EMT (shown here unplated) held fast, surpassing UL requirements.

BETTER WELDING

on new CIRTUBE EMT means easier, split-free bending

THERE are many reasons why new CIRTUBE EMT will help you get faster, cleaner wiring jobs. Most of them are listed here.

One *big reason,* however, is *continuous induction welding*—by far the best technique available for making bead-free, split-free welds on high quality EMT.

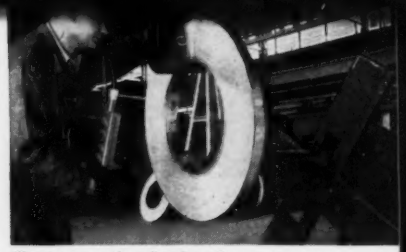
It is virtually impossible to split an induction-welded EMT no matter how severe the bends. And the perfectly clean weld means uniform roundness—easier, neater bending without the slightest kink or flattening. Your men get it right the first time around.

Try induction-welded new CIRTUBE EMT soon as you can. Your wholesaler has it now—bundled with distinctive orange colored tape to identify the EMT manufactured to Circle's quality standards.

CIRCLE WIRE & CABLE
a subsidiary of CERRO DE PASCO CORPORATION

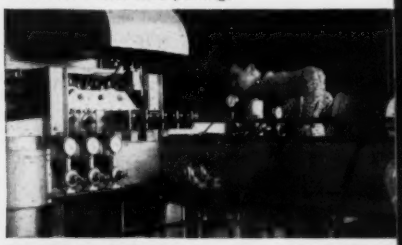
PLANTS: Maspeth and Hicksville, N. Y. **SALES OFFICES & WAREHOUSES:** in all principal cities
RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES
NEOPRENE SHEATHED CABLES • "CIRTUBE" EMT

CIRTUBE EMT *Ask for it!*



Proper steel plus! The best cold rolled steel plus the right handling give CIRTUBE EMT its natural bendability.

Easy fishing! A baked-on protective coating gives CIRTUBE EMT a built in lubrication for easier wire pulling.



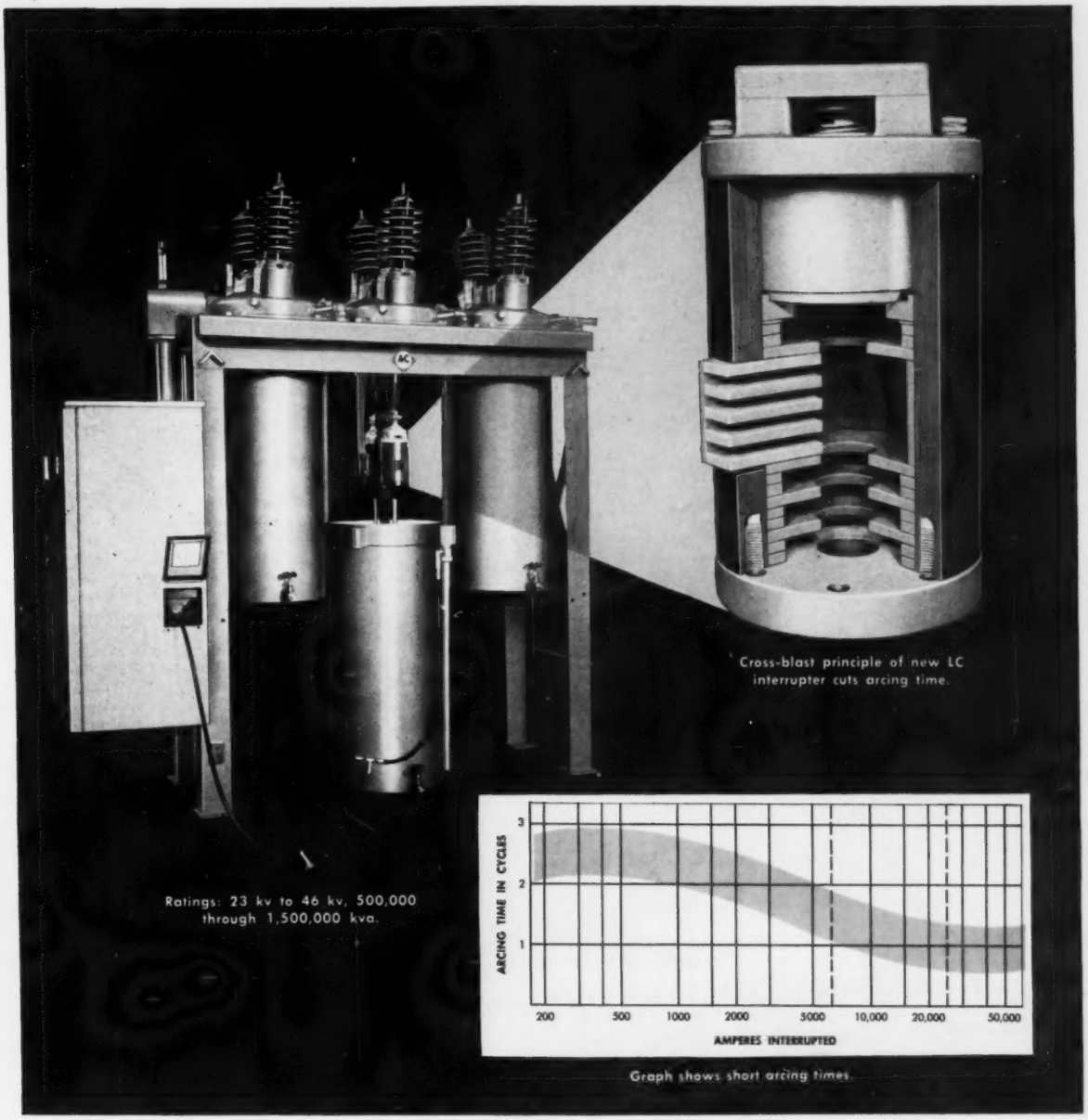
Lifetime exterior finish! Hard galvanized finish for durability; polished satin lustre for lasting good looks.

Automated quality control! Automatic controls assure complete and continuing uniform quality of product.

Tight, easily handled bundles! Bright, orange tapes hold CIRTUBE EMT securely for easy handling on and off the job.

Fast, friendly service! Well-known Circle service through a nation-wide network of well stocked nearby warehouses.

ALLIS-CHALMERS



industry's newest interrupter

Here's new high-speed interrupting efficiency for Allis-Chalmers frame-mounted circuit breakers. New LC interrupter cuts arcing time. There's greater system protection, less oil contamination. Dielectric strength is extended, maintenance lowered.

More A-C breaker bonus benefits! You get mechanically trip-free operation. Highly successful *Pneu-Draulic* operator provides fast operation—ends moisture, rust, freezing. Hydraulic power-operated tank lifter cuts raising and lowering time by 80%.

For all the facts on these frame-mounted breakers, call your nearby A-C office or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.*

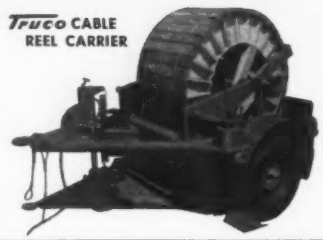
Pneu-Draulic is an Allis-Chalmers trademark. A-1248

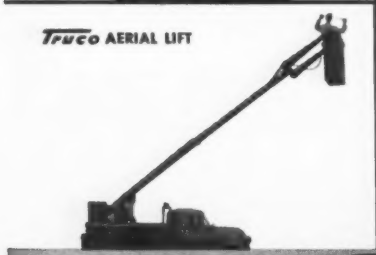
For phone number of closest representative see advertising index in back of book.

NEW Truco TURRET DERRICK

GIVES 3-DIMENSIONAL CONTROL

Safe
Simple to operate
Cuts Cost,
saves man hours
Compact,
folds quickly within
length of truck
Versatile
With Truco digger attachment, derrick can dig the hole, set the pole.
With Truco fiberglass basket, unit becomes an aerial lift.
Handles 90-ft. pole or heavy transformer
Jack legs for stability





Write or phone for full details

Truco

Ask for name of nearest distributor

TRUCK Equipment COMPANY

3963 WALNUT ST. • AComa 2-7905 • DENVER 5, COLORADO

Meetings Calendar

MARCH

21-22—*Wood Pole Conference*, Oregon State College Campus, Corvallis, Ore.

23-25—*Electrical Maintenance Engineers Assn. of California*, Industry Lighting Conference and Show, Shrine Exposition Auditorium, Los Angeles.

31-April 1—*Pacific Coast Electrical Assn.*, Engineering and Operating Section conference, Hotel Claremont, Berkeley.

APRIL

6-8—*Northwest Public Power Assn.*, annual meeting, Eugene Hotel, Eugene, Ore.

7-9—*B. C. Electrical Inspectors Assn.*, annual conference, Astor Hotel, Burnaby, B. C.

11-12—*Pacific Coast Electrical Assn.*, Administrative Services, conference, Huntington-Sheraton Hotel, Pasadena.

20—*International Association of Electrical Inspectors*, Utah chapter annual meeting, Salt Lake City.

22—*IAEI*, Idaho Chapter annual meeting, Twin Falls.

22-27—*San Diego Bureau of Home Appliances*, annual Spring Fair, Balboa Park.

24-26—*Rocky Mountain Electrical League*, spring conference, Harvest House, Boulder, Colo.

25-26—*Illuminating Engineering Society*, Intermountain Regional Conference, Mountain Shadows Resort, Scottsdale, Ariz.

27-29—*Northwest Electric Light & Power Assn.*, Engineering and Operation Section, Personnel & Safety Section, Florence Hotel, Missoula, Mont.

27-30—*Western Air Conditioning, Heating, Ventilation & Refrigeration* Conference and Show, Shrine Exposition Auditorium, Los Angeles.

MAY

3-5—*Western Joint Computer Conference*, San Francisco.

3-5—*Illuminating Engineering Society*, South Pacific Regional Conference, Hollywood Roosevelt Hotel, Los Angeles.

9-10—*IES*, Pacific Northwest Regional Conference, Benjamin Franklin Hotel, Seattle.

9-12—*National Electrical Contractors Assn.*, District 5, and IBEW, District 7, joint meeting, Westward Ho Hotel, Phoenix.

9-12—*NECA*, Tri-District (Districts 6, 8, 9) regional conference, Olympic Hotel, Seattle.

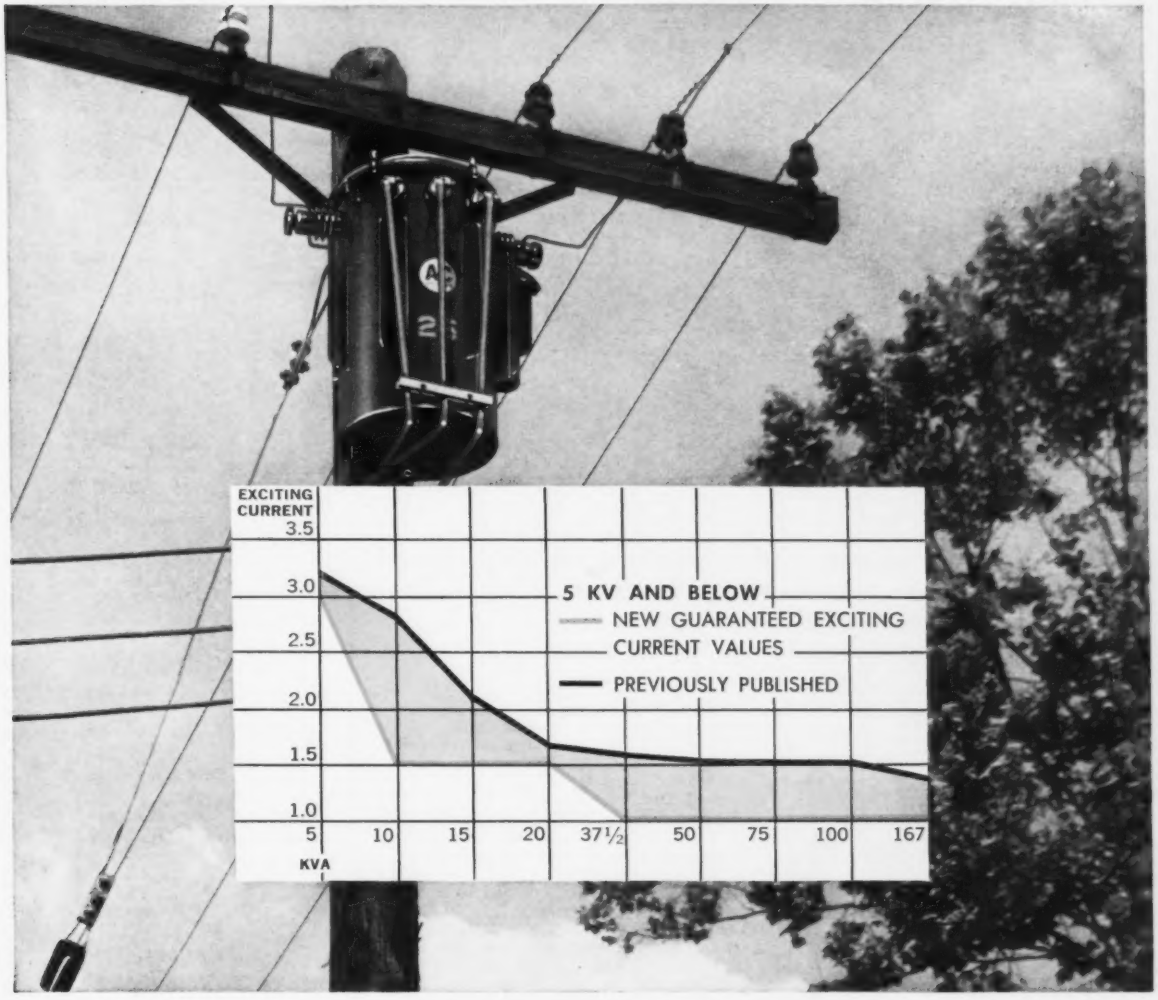
9-12—*Pacific Coast Electrical Assn.*, annual convention, Stardust Hotel, Las Vegas.

19-20—*Northwest Public Power Assn.*, Engineering & Operations Section, annual meeting, Elks Lodge, Port Angeles, Wash.

23-25—*Northwest Electric Light & Power Assn.*, Business Development Section, Chinook Hotel, Yakima.

ALLIS-CHALMERS

A-1253



More revenue-producing power for you

with Allis-Chalmers distribution transformers

Exciting current cut as much as 50%!
No small figure whether you consider it by the unit or by the system!

It's all a matter of efficiency. And the published curves above show how much more efficiency you get with Allis-Chalmers distribution transformers.

Here's how it pays off for you. A-C units cut generating capacity requirements. Just a bare minimum of nonrevenue-producing exciting current is needed. As a result, copper loss on transmission lines is reduced. And there's less demand for system power-factor corrective equipment. Now your system carries a higher amount of revenue-producing power!

Advanced research, development, materials and facilities are the keys to Allis-Chalmers continuing improvement program.

Your nearby A-C office has all of the revenue-boosting facts. Or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.*

For phone number of closest representative see advertising index in back of book.

*Trademark

Fan Fanner Superformed Products

"Superforms* sure fill the bill for a STANDARDS ENGINEER!"

"Fanner Superformed products meet our standards all along the line . . . *technical superiority, accurate manufacture, uniform quality, dependable performance.*"

More and more Standards Engineers . . . *the men who must find BETTER ways to do things BETTER* . . . are testifying that Superforms meet the highest standards. A-1580A

FANNER Superformed with a "PROTECTIVE TWIST"

ARMOR RODS . . . Protect long-span T&D lines at supports

LINEGUARDS . . . Protect short-span T&D lines at supports

PATCH RODS . . . Repair damaged conductors

TAP ARMOR . . . Protects conductor at tapping points

FANNGRIPS . . . For dead-ending strands and conductors

FANNSPLICES . . . Join two ends of conductor wire

PLASTIC PRODUCTS . . . For conductor surface protection

FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

LETTERS TO THE EDITOR

To the Editor:

This letter is a letter of appreciation of the nice things you had to say about the American Standard Requirements for residential wiring in your editorial in the November issue of ELECTRICAL WEST. You have stated quite accurately the intent of the upgrading of the Residential Wiring Handbook and your endorsement of this activity is a much appreciated service to the ever-expanding electrical industry.

H. H. Watson
Commercial Engineer,
General Electric Co.
Bridgeport, Conn.

To the Editor:

We have read with interest, in the Jan. 15 edition of ELECTRICAL WEST, your article on flexible cables and attachment plugs for house trailers and thought you might be interested in the work which has been done in California in this respect.

The California Rules and Regulations relating to electrical equipment in trailer coaches have been amended to require that attachment caps on trailer coach power supply cables conform to the American Standards Assn.; configuration standards ASA C73.1-1957 and efforts are presently being made to require the same configuration for trailer park receptacles under the State Trailer Park Act.

Our compliments to you for the fine job you have been doing, in keeping the electrical industry currently informed.

Lowell Nelson
Chief, Division of Housing
California Dept. of Industrial Relations

To the Editor:

We notice a brief article in the news section of ELECTRICAL WEST magazine entitled, "New High Voltage Lab at Los Angeles." The copy contains the erroneous statement "also incorporates the only high current testing setup on the coast."

The fact is, our own high voltage laboratory has been in operation since 1954 with comparable facilities for research and production testing of high voltage and high current switches and switchgear.

Don F. Hamm
Advertising Manager
Jennings Radio Mfg. Corp.
San Jose, Calif.

To the Editor:

I received the February issue of ELECTRICAL WEST today and, as usual, quickly scanned it for outstanding items. Of course I came to the News Roundup on p 5 immediately and found I had to turn the magazine upside down to appreciate the picture showing what Westinghouse engineers have accomplished in Sharon, Pa., over the last 60 years.

I am sure that we do not want our friends to think that we have made no technological improvements in this field.

L. N. Goodell
Manager, Electrical Products Dept.
Westinghouse Electric Corp.
Sunnyvale, Calif.

Sorry, it was just one of those days.—The editor.

Here are the Graybar Offices in the West

ARIZONA

Phoenix:	1700 North 22nd Ave. ALpine 2-2371
Tucson:	212 South Park Ave. MAin 2-6439

CALIFORNIA

Bakersfield:	2828 "K" St. FAirview 4-4755
Fresno:	2626 Hamilton Ave. ADams 7-4175
Long Beach:	800 West 16th St. HEmlock 2-2911
Los Angeles:	210 Anderson St. ANgelus 3-7282
Oakland:	1911 Union St. GLencourt 1-5451
Oceanside:	805 N. Tremont St. SAratoga 2-2141
Sacramento:	1900 - 14th St. HIckory 4-8830
San Bernardino:	655 South "H" St. TUrner 9-1051
San Diego:	720 State St. BElmont 3-1361
San Jose:	1376 N. Tenth St. CYpress 2-9090
San Francisco:	1750 Alameda St. MArket 1-5131
Santa Ana:	301 French St. KImberly 3-8309
Santa Barbara:	329 S. Salinas St. WOodland 5-1013
Van Nuys:	15520 Cabrito Road STate 2-9600

COLORADO

Colorado Springs:	630 West Vermijo Ave. MElrose 4-3701
Denver:	104 Wazee Market TAbor 5-7111

IDAHO

Boise:	1325 Idaho St. BOise 3-2594

MONTANA

Butte:	604 E. Aluminum St. BUtte 3233

OREGON

Eugene:	2380 West Broadway DIamond 4-2224
Portland:	N.E. 60th and Banfield ATlantic 8-5661

UTAH

Salt Lake City:	336 North Third West St. ELgin 9-8771

WASHINGTON

Seattle:	King & Occidental Sts. MUtual 2-0123
Spokane:	West 1033 Gardner Ave. FAirfax 7-6611
Tacoma:	2112 "A" St. MArket 7-0164

FOR IMMEDIATE SERVICE ON EVERYTHING ELECTRICAL CALL THE OFFICE NEAREST YOU

You can save money on inventory with Graybar as your auxiliary warehouse

Use Graybar as your auxiliary warehouse and you can shorten your stock on most electrical equipment and supplies. Graybar stock designed for utility use is near at hand, wide in range, and large enough for any contingency.

This means that you can materially lower either the interest charges on inventory or the cash investment you have in it.

Other savings: you can reduce losses on surplus, on obsolescence, on equipment damaged in receiving and storing.

Start with a local call . . . Why not consult with your Graybar salesman and discuss a specific plan based on your system needs?

Employee-owned Graybar, a part of your local community, has served utilities continuously since the first lines went up. Whether you require 3 items or 3,000, Graybar is your most practical source for most electrical utility equipment and supplies.

When Graybar is your auxiliary warehouse—	You save on storeroom costs Reduce inventory investment Insure prompt delivery Step up man-hour efficiency Simplify bookkeeping

932

GraybaR

ELECTRIC COMPANY, INC.

420 Lexington Avenue, New York 17, N.Y.

Everything Electrical GraybaR

IN OVER 130 PRINCIPAL CITIES

LOCAL SERVICE TO UTILITIES THROUGH COAST-TO-COAST WAREHOUSING

How architectural design and planned lighting create an image of strength and friendliness in a bank

Somewhere between the coldness of Greek temple design and the casualness of the ranch house prototype, there should be an architectural concept for banks that inspires confidence, reflects stability, yet is not formidable. So reasoned Harry Weese, architect. Out of that came the new home of State Bank of Clearing, Chicago. Meaningfully shaped and purposefully illuminated, an image is created at State Bank which speaks of progressiveness, strength and friendliness.

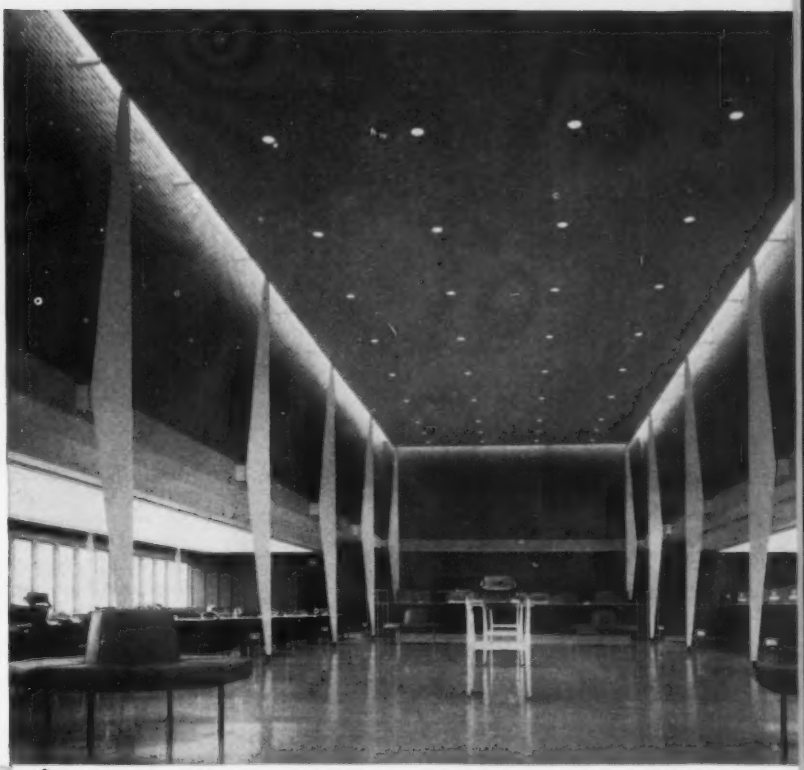
Lighting is planned to create an inviting effect and at the same time is highly functional. Patrons move through an entrance of restful subdued light into a lower lobby of slightly higher light intensity, then into the main, high ceiling banking area. There a combination of indirect light and spot lighting presents a dramatic effect. A suspended ceiling achieves a peripheral clerestory so walls of brick are texture-lighted day and night.

On one side of the main high room is the officer area and on the other, the teller area—both flooded with functional, non-glare, high intensity light which tends to direct customers to the areas. Curtis-AllBrite visioneers worked hand in hand with architect, illuminating engineer and contractor to accomplish this illumination innovation. Curtis-AllBrite Lighting, Inc., AllBrite Lighting Division, 352 Shaw Road, So. San Francisco, California; Curtis Lighting Division, 6135 West 65th Street, Chicago 38, Illinois.

CURTIS
visioneers in planned lighting
All-Brite

Banking is serious business, so high visual acuity is necessary in the areas where close work is done. Here the officer area is bathed in a high level of soft, shadowless, glare-free illumination that is accomplished by a Curtis Strato-Lux Luminous Ceiling. Exclusive Curticell Louver-Diffuser panels combine diffusion of light source with proper shielding of the diffusing medium.

State Bank of Clearing, Chicago, Illinois, where an architectural concept and planned lighting bring something new and different in bank design and function. Illumination, both day and night, heightens an atmosphere of friendliness.



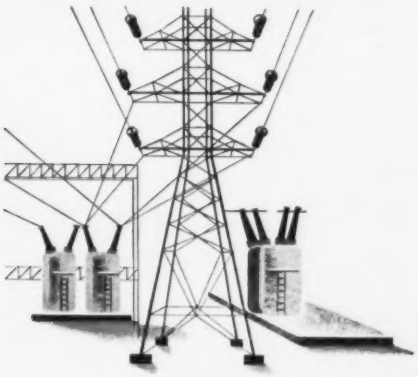
The main banking area where walls are texture-lighted by a wash of indirect lighting achieved with Curtistrip. Spotlights in the suspended ceiling add an atmosphere of action and provide high function, too.

Architect: Harry Weese & Associates.

Electrical Engineer: Sam R. Lewis.

Electrical Contractor: Crescent Engineering.

FARGO
HOT LINE CLAMPS
work right
every time
Fargo's "AGE Series" have heavy duty vanadium steel springs, vise-type design and bell mouth jaws to prevent loosening by vibration or "cold-flow" . . . extra wide, smooth, "like metal" jaws provide a firm contact on run to hold joint temperatures down . . . improved hook design of the jaw eliminates slip or twisting on run during installation . . . enclosed and inhibitor protected threads assure easy installation and removal . . . available in bronze or aluminum for conductors up to 2,000,000 CM.
Ask your Line Material Field Engineer for complete details.
Distributed by
LINE MATERIAL INDUSTRIES
McGraw-Edison Company
Milwaukee, Wisconsin
In Canada, CANADIAN LINE MATERIALS, LTD., Toronto, Canada
Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York
FARGO



UTILITIES

STOP WEEDS

with safe, effective

SIMAZINE or ATRAZINE

pre-emergence *pre- or post-emergence*

HERBICIDES

Economical, long residual Geigy herbicides save time and money—do the job right the first time. One application stops weeds before they start—gives you season long control.

Safe to humans and animals, non-irritating to skin, non-flammable, non-corrosive to equipment. Safe to use on valuable land. Available through leading distributors.

FREE BROCHURE: *New full color booklet contains complete directions, diagrams, applications and other useful data for both Simazine and Atrazine.*

Geigy *ORIGINATORS OF DDT INSECTICIDES*

MAIL COUPON TODAY

GEIGY AGRICULTURAL CHEMICALS,
Division of Geigy Chemical Corporation
Saw Mill River Road, Ardsley, N.Y., Dept. EW-3

Send free weed control brochure to:

*Name*_____

*Company*_____ *Position*_____

*Address*_____

*City*_____ *State*_____

For phone number of closest representative see advertising index in back of book.

"How your purchase dollars
return to you
through Westinghouse leadership"

A. J. Maslin, *Manager, Substation and Tap Changer Engineering*

New Triplex three-phase distribution regulator costs 30% less, uses 26% less pad space, cuts weight 39%

Now you can enjoy the true economies of a low-cost, three-phase feeder voltage regulator . . . with all the *time-proved capabilities* of the Westinghouse line of distribution regulators. In fact, Westinghouse uses three well-known URF regulators, gang-operated in a single tank to bring you these big savings. The new type SVR-FT regulator is completely automatic and self-contained. Available in 8.6- and 13.2-kv voltage classes.

The savings of standardized design are passed along to you in both initial cost savings and reduced operating costs. Savings of 30% and more. Answering the need for compact units, the SVR-FT requires only 49″ x 87″ of free area for a 500-kva regulator . . . 26% savings in space. This same unit weighs just 10,700 pounds . . . 39% savings in weight.

You also gain all the advantages that have been proved in hundreds of Westinghouse URF installations: continuous monitoring with the CVR inverse time delay relay, direct drive geneva tap changer, and 1¼%-step regulation. Check the picture captions for more details.

Call your Westinghouse sales engineer to learn more about the way your purchase dollars return to you through extra values such as the SVR-FT.

J-70937

Continuous system voltage monitoring of the CVR relay provides faster correction of abrupt voltage changes . . . holds closer to set balance voltage.

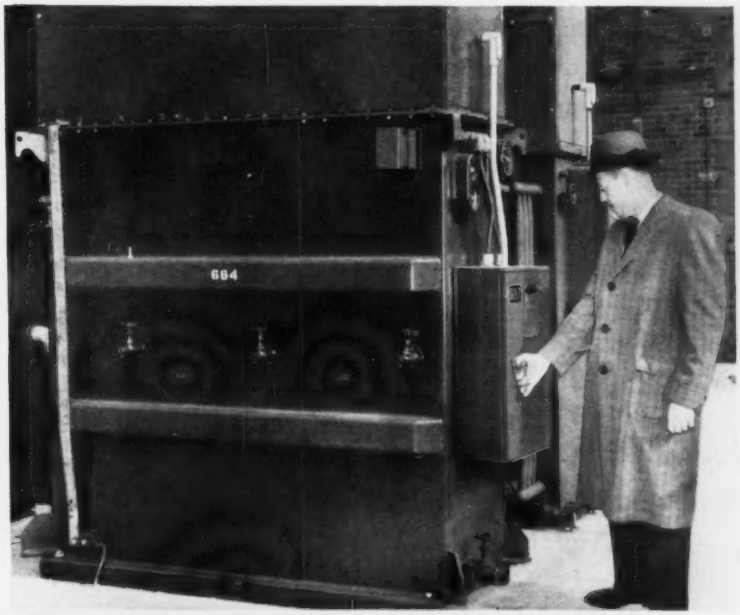
YOU CAN BE SURE...IF IT'S **Westinghouse**

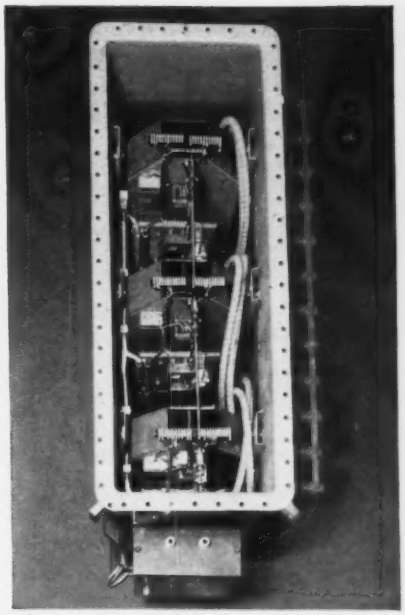
WATCH "WESTINGHOUSE LUCILLE BALL DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

For phone number of closest representative see advertising index in back of book.

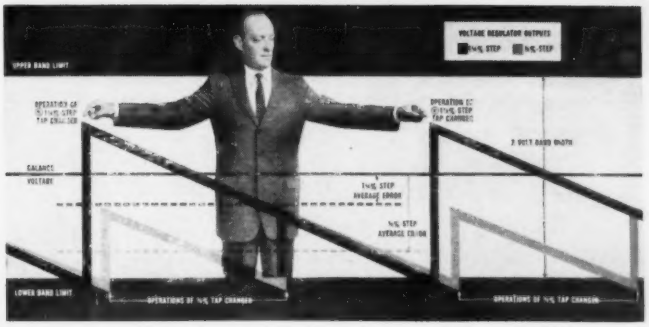
Instant-response tap changer corrects voltage 15 times faster. Requires only one second for 1¼% correction after relay operation; full buck to full boost in 13 seconds.

Mr. E. H. Carroll, Westinghouse representative, inspects the installation of this SVR-FT voltage regulator which offers a low-cost approach to three-phase regulation. Operating on the Oklahoma Gas and Electric system, the new regulator is completely self-contained.





Three single-phase units are mechanically interlocked . . . uniform tap positions assured. Units are interchangeable . . . can be removed without disturbing others. Separate tap changer compartments prevent contamination of main tank oil.



Sixteen-step (1¼%) regulation provides narrowest *effective* bandwidth. There are 42% fewer operations than with any other three-phase regulator . . . less wear, longer life.

All your kitchen appliances will be clean, cool electric appliances in a Medallion Home

An all-electric kitchen is just one of the advantages you'll find in a home bearing the Medallion Home award

Every Medallion Home guarantees you:

1. An all-electric kitchen, with major electric appliances such as a modern range and oven ... all part of the basic home plan and price.

2. Full Housepower wiring for present, and future needs to handle the appliances you own today *plus* those you'll want tomorrow.

3. Provisions for proper lighting in all areas where it's needed to insure your family's safety and comfort.

And, for the ultimate in luxury living, there's the **all-electric** home—the Gold Medallion Home with a modern electric heating system such as the amazing electric heat pump that both heats *and* cools.

Always remember ... look for the Medallion award before you buy *any* new home.

SOUTHERN CALIFORNIA Edison COMPANY *helps you* LIVE BETTER—ELECTRICALLY

ELECTRICAL WEST

VOL. 124, NO. 3
MARCH 1960

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.

Western utility executives report on customers and kwh use. Returns in annual survey show that . . .

THE WEST KEEPS PACE IN SALES

Western utility customer and consumption figures were up again in 1959, according to reports from 74 executives responding in ELECTRICAL WEST's annual survey of sales accomplishment.

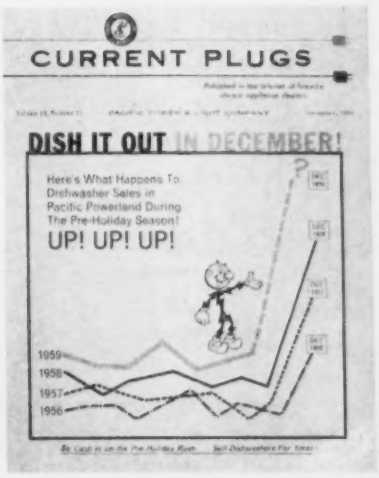
With 9,039,894 customers, the answering group represents 97% of the West's electric meters. Last year the same companies reported 8,680,221 customers.

Average annual residential consumption ranged from a high of 15,408 kwh to a low of 295 kwh. Forty-five of the answering utilities were above the national average of 3,550 kwh per customer and 22 reported home use of more than 7,000 kwh. Only two experienced a drop in kwh consumption as compared with 1958.

Of the more than 9 million customers served 7,656,609 were in the residential classification. Commercial users accounted for 1,055,660 of the total.

As reported earlier by *Electrical Merchandising*, the West enjoyed a good year in equipment sales. The Pacific region led the national average in every category except room air conditioners, dehumidifiers and water heaters (a tie). The Mountain region was ahead of the U. S. in all but air conditioners, dehumidifiers, vacuum cleaners and refrigerators. It also tied in water heaters.

Utility bulletins such as the ones shown (from Arizona PS, PG and E, PP&L) keep dealers informed on cooperative programs and sales accomplishment. Utility and league sponsored shows and cooking schools build prospect lists. Above, an exhibit at the San Diego Bureau Spring Fair; at right, a section of the crowd (1,308 in all) attending one of SMUD's 14 cooking schools



UTILITY CUSTOMERS

Utility Territory	Total Customers 1959	Total Customers 1958	Residential-Urban & Rural 1959	Residential-Urban & Rural 1958
PG and E	1,915,297	1,848,336	1,572,610	1,513,635
Southern California Edison	1,570,394	1,501,812	1,353,046	1,287,895
Los Angeles Dept. of W&P	902,663	884,384	758,376	742,581
San Diego G & E	315,847	293,923	268,316	248,397
PS of Colorado	313,743	303,655	271,886	263,167
Pacific P&L	289,511	284,031	251,231	246,511
B. C. Electric, Vancouver	288,145	276,395	246,944	236,288
Portland GE	251,599	245,502	*221,977	*216,560
Seattle City Light	231,948	229,867	207,872	206,319
Utah P&L	230,043	223,854	*203,588	*197,852
Puget Sound P&L	218,210	207,432	196,828	187,269
Arizona PS	170,438	161,514	141,653	133,941
Sacramento MUD	153,920	142,572	134,044	123,434
Montana Power	148,498	145,821	127,290	125,113
Idaho Power	134,314	131,302	111,474	110,126
Hawaiian Electric	111,378	106,455	94,287	90,185
California Electric Power	109,377	98,661	92,445	82,539
Calgary Power	106,000	97,976	50,000	47,244
PS of New Mexico	97,284	91,326	85,288	79,841
El Paso Electric	93,307	85,915	82,463	75,868
California Oregon Power	91,589	88,879	74,349	72,157
B. C. Power Commission	83,540	70,028	70,491	66,644
Salt River Power District	79,975	68,609	73,387	62,943
Tucson GEL&P	73,697	68,824	63,838	59,160
Tacoma City Light	64,128	62,831	56,250	55,245
Snohomish County PUD No. 1	59,157	56,815	53,945	51,839
B. C. Electric, Victoria	54,243	52,463	46,706	45,137
Glendale PS Dept.	52,503	51,484	44,109	43,149
Pasadena L&P Dept.	49,905	49,120	42,997	42,308
Southern Colorado Power	48,172	47,408	41,601	40,904
Southwestern PS, N. M. Division	43,903	42,082	37,489	35,722
Sierra Pacific Power	43,735	40,196	36,542	33,347
Colorado Springs PU	38,495	37,015	37,905	36,600
Burbank PS	37,442	36,931	31,220	30,864
California-Pacific Utilities	35,438	35,064	29,133	28,741
Southern Nevada Power	35,021	32,610	28,277	26,180
Colorado Central Power	34,024	31,342	30,397	27,936
Clark County PUD No. 1	32,926	32,088	29,465	28,675
Imperial Irrigation District	29,831	28,925	23,172	22,538
Riverside PU Dept.	29,709	28,206	26,097	24,687
Modesto Irrig. District	27,717	27,002	23,303	22,674
Eugene W&E Board	27,529	26,497	24,231	23,171
Anaheim Dept. of LW&P	25,247	22,196	22,200	19,446
Grays Harbor County PUD No. 1	21,967	21,756	17,959	17,782
Cowlitz County PUD No. 1	21,260	21,267	18,827	18,836
Turlock Irrigation District	20,829	20,089	17,316	16,982
Hilo Electric	18,443	18,415	14,608	14,566
Cheyenne LF&P	16,655	15,963	14,699	14,064
Chelan County PUD No. 1§	16,190	15,864	14,153	13,860
Alameda Bureau of Electricity	16,175	15,755	14,411	13,967
Grant County PUD No. 2	13,969	13,883	10,680	10,665
Central Lincoln People's UD	12,157	11,820	10,075	9,750
New Mexico Electric Service	11,920	11,520	9,569	9,281
Chugach Electric Assn.	11,585	10,760	10,781	10,074
Lewis County PUD No. 1	10,788	10,771	10,378	10,378
Benton County PUD No. 1	10,062	9,846	8,853	8,696
Provo Dept. of PU	9,977	9,661	8,772	8,483
Anchorage L&P Dept.	7,848	7,699	6,024	5,912
Pacific County PUD No. 2	7,432	7,404	6,075	6,025
Intermountain REA	7,425	7,401	3,307	3,513
Jemez Mountains Elec. Co-op.	6,876	6,210	4,065	3,626
Mason County PUD No. 3	6,430	6,268	5,831	5,715
Montana-Dakota Utilities	6,379	6,155	5,522	5,303
City of Mesa	5,976	5,629	4,922	4,627
Morgan County REA	4,799	4,756	2,635	2,597
Benton REA	3,923	3,575	‡3,364	‡3,153
Northern Lights	3,689	3,599	3,205	3,123
Alaska EL&P	3,309	3,212	2,701	2,624
Raton PS	3,042	3,018	2,354	2,343
Roosevelt County Electric Co-op.	2,890	2,826	1,805	1,809
Elko Lamoille Power	2,662	2,588	2,179	2,117
Matanuska Electric Assn.	2,012	1,759	1,445	1,260
Hill County Electric Co-op.	1,911	1,930	107	109
Lahaina L&P	1,472	1,474	1,265	1,294

*Includes agricultural. †Includes street and highway lighting. ‡Includes seasonal. §Average number for year.

In addition to the 57,445 room conditioners listed on the equipment sales tables, pp 70, 71, the reporting utilities listed 50,764 central air conditioning systems, some including room conditioners.

The group added 1,911 room heaters in addition to the 6,724 central heat pumps listed.

Accelerated promotion of electric heating paid off in added kw in 1959 and several companies have plans to step up this activity again in 1960.

Following are load additions reported in this field:

HEATING LOAD ADDED IN KW

Alameda PU Dept.	600
Benton County PUD	4,340
B. C. Electric, Victoria	476
B. C. Power Commission	1,000
Burbank PS Dept.	666
California Electric Power	400
California Oregon Power	12,800
California-Pacific Utilities	695
Central Lincoln PUD	4,000-5,000*
Chelan County PUD	4,200
Clark County PUD	15,260
Colorado Springs PU Dept.	0**
Cowlitz County PUD	4,128***
Eugene W&EB	17,452
Grays Harbor County PUD	3,089
Idaho Power	2,450
Intermountain REA	60
Mason County PUD	564
Mesa City Utilities	300
Morgan County REA	110
Northern Lights	62
Pacific County PUD	1,275
PG and E	60,450*†
Pacific Power & Light	26,341†
Portland GE	35,000
Public Service of N. Mexico	110
Puget Sound P&L	35,000
Public Service of Colorado	113
Roosevelt County Elec. Co-op.	74
Sacramento MUD	4,405
Salt River Power District	6,461
Seattle City Light	30,300
Sierra Pacific Power	200*
Snohomish County PUD	13,995
Southern California Edison	15,998
Southern Nevada Power	840
Southwestern PS, N. M. Div.	473
Tacoma City Light	6,500
Utah P&L	1,466†

*Estimated
**Expect some in 1960
***Estimated system load, connected load is 7,568
†Residential

Utility sales books and programs for 1960 indicate another good year. Here are a few of the plans:

Burbank will increase its effort on dryers.

California Oregon Power will place the emphasis in this order: ranges, water heaters; electric heat; refrigerator-freezers, air conditioners; laundry equipment; dishwashers.

California-Pacific Utilities will continue its Medallion Home and Housepower programs and will work for additional dealer and contractor participation. Although saturation

of certain major appliances are in excess of 65 and 70%, dealers have continued to make substantial sales, the utility reports, and the number of major appliance units sold annually indicates sales of 15.8 units per 100 residential customers.

Chelan PUD will include a promotion on refrigerated air conditioners.

Cowlitz PUD will add yard lighting, dehumidifiers, dishwashers, air conditioning and adequate wiring.

El Paso Electric will put additional effort on air conditioners, heat pumps, commercial lighting and commercial cooking.

Idaho Power will shift the emphasis to electric heating, air conditioning, dishwashers, dryers.

Imperial Irrigation District will promote strongly quick recovery water heaters and heat pumps.

Portland General Electric says its emphasis will continue to shift from individual electric appliances to the Medallion Home program and total electric living.

Pacific Gas and Electric, in its Market Outlook for Northern and Central California, sees a potential of 1.5 million prospects for appliance sales. It will work in cooperation with industry promotions, coordinated through Northern California Electrical Bureau, with a sales objective of 666,700 electric appliance units. It will give full support to Housepower, Medallion Home and Light for Living programs.

Puget Sound Power & Light will continue to feature summer load promotions.

Riverside will continue the Medallion program, with emphasis on heating and heat pumps.

Seattle City Light will continue emphasis on commercial electric cooking, water heating and air conditioning.

Southern California Edison will continue the Medallion Home program, with special emphasis on heat pumps, other types of electric heating and water heating.

Sacramento MUD will continue to promote through cooking schools. With a big increase in commercial installations of heat pumps in 1959, it plans to emphasize Medallion Home programs more strongly in 1960, as well as resistance space heating.

Utah Power & Light will put special emphasis on electric house heating. It feels that 1960 is the year to sell Total Electric.

Tacoma City Light will emphasize major appliances and 200-amp service entrance equipment.

RESIDENTIAL CONSUMPTION

POWER COMPANIES

Utility Territory	Average Annual Kwh Residential 1959	1958	1957	1956
Southern Nevada Power	10,231	9,860	9,373	9,777
Portland GE	9,186	8,493	8,422	8,103
California Oregon Power	9,106	8,633	8,667	8,421
Puget Sound P&L	8,609	7,840	7,642	7,205
Pacific P&L	7,621	7,047	6,931	6,563
Idaho Power	7,227	6,959	6,764	6,463
California-Pacific Utilities	6,386	6,089	5,895	5,729
Sierra Pacific Power	5,228	5,050	4,930	4,675
B. C. Electric, Vancouver	4,769	4,570	4,461	4,202
Hawaiian Electric	4,575	4,393	4,225	3,983
B. C. Electric, Victoria	4,445	4,063	3,908	3,605
Alaska EL&P	4,381	4,095	3,849	3,682
Utah P&L	4,291	4,128	4,047	3,891
Raton PS	4,160	3,880	3,560	3,309
Montana Power	3,981	3,736	3,684	3,471
Arizona PS	3,667	3,567	3,180	2,962
El Paso Electric	3,574	3,553	3,147	2,936
Lahaina L&P	3,303	3,072	3,204	3,213
Tucson GEL&P	3,179	2,966	2,717	2,521
PG and E	3,154	3,046	2,923	2,747
Elko Lamoille Power	3,039	2,831	2,685	2,486
Colorado Central Power	3,004	2,823	2,677	2,490
New Mexico Electric Service	2,982	2,944	2,715	2,488
Hilo Electric	2,877	2,783	2,688	2,534
San Diego G&E	2,870	2,805	2,752	2,639
Cheyenne LF&P	2,834	2,642	2,636	2,503
PS of Colorado	2,833	2,649	2,541	2,362
Mont.-Dak. Utilities, Sheridan	2,832	2,664	2,305	2,096
California Electric Power	2,760	2,699	2,433	2,349
PS of N. M.	2,708	2,526	2,332	2,132
Southern Colorado Power	2,583	2,460	2,329	2,217
Southwestern PS, N. M. Division	2,713	2,644	2,390	2,143
Southern California Edison	2,485	2,360	2,288	2,165
Calgary Power	*2,450	2,247	2,119	2,104

MUNICIPAL UTILITIES

	1959	1958	1957	1956
Eugene W&E Board	11,686	10,265	9,908	9,000
Tacoma City Light	*9,300	8,955	9,040	8,977
Seattle City Light	8,660	8,063	7,961	7,786
Anchorage L&P Dept.	3,914	3,521	3,420	2,844
Mesa City Utilities	3,819	3,548	...	...
Provo Dept. of PU	3,180	3,226	3,180	3,180
Riverside PU Dept.	2,850	2,794	2,760	2,880
Colorado Springs PU Dept.*	2,800	2,626	2,525	2,355
Burbank PS Dept.	2,620	2,530	2,430	2,330
Pasadena MU	2,455	2,395	2,353	2,224
Glendale PS Dept.	2,350	2,400	2,232	2,136
Alameda PU Dept.†	2,396	2,379	2,295	2,238
Los Angeles Dept of W&P†	2,331	2,278	2,158	2,106
Anaheim Dept. of LW&P	2,300	2,225	1,958	1,674

DISTRICTS, REAs, COMMISSIONS

	1959	1958	1957	1956
Benton REA	15,408	13,992	13,776	11,987
Grant County PUD No. 2	15,075	13,484	13,856	13,270
Cowlitz County PUD No. 1	13,561	12,136	12,207	11,885
Benton County PUD No. 1	12,062	11,428	11,872	11,183
Clark County PUD No. 1	10,798	9,631	9,434	8,887
Central Lincoln PUD	10,030	9,038	9,033	8,792
Snohomish County PUD No. 1	9,725	8,559	8,329	7,746
Grays Harbor County PUD No. 1	9,441	8,450	8,320	7,740
Pacific County PUD No. 2	8,967	8,289	8,101	8,607
Lewis County PUD No. 1	8,633	7,918	7,784	7,664
Chelan County PUD No. 1	8,424	7,657	7,600	7,172
Hill County Electric Co-op.	7,489	6,698	6,711	6,423
Mason County PUD No. 3	7,486	7,039	7,354	7,132
Imperial Irrigation District	6,703	6,694	5,892	5,700
Morgan County REA	5,436	4,933	5,056	4,774
Turlock Irrigation District	5,089	4,816	4,574	4,291
Salt River Power District	4,900	4,750	4,278	4,023
Chugach Electric Assn.	4,710	4,408	4,005	3,587
Roosevelt County Electric Co-op.	4,687	4,369	4,048	3,801
Modesto Irrigation District	4,124	3,919	3,755	3,525
Matanuska Electric Assn.	4,037	3,755	3,494	3,304
Sacramento MUD	3,821	3,597	3,388	3,065
B. C. Power Commission	3,744	3,652	3,573	3,279
Jemez Mountains Electric Co-op.	1,794	1,792	1,650	1,575
Northern Lights	522	468	430	371
Intermountain Rural Elec. Assn.	295	239	208	194

*Estimated. †Period ending June 30.

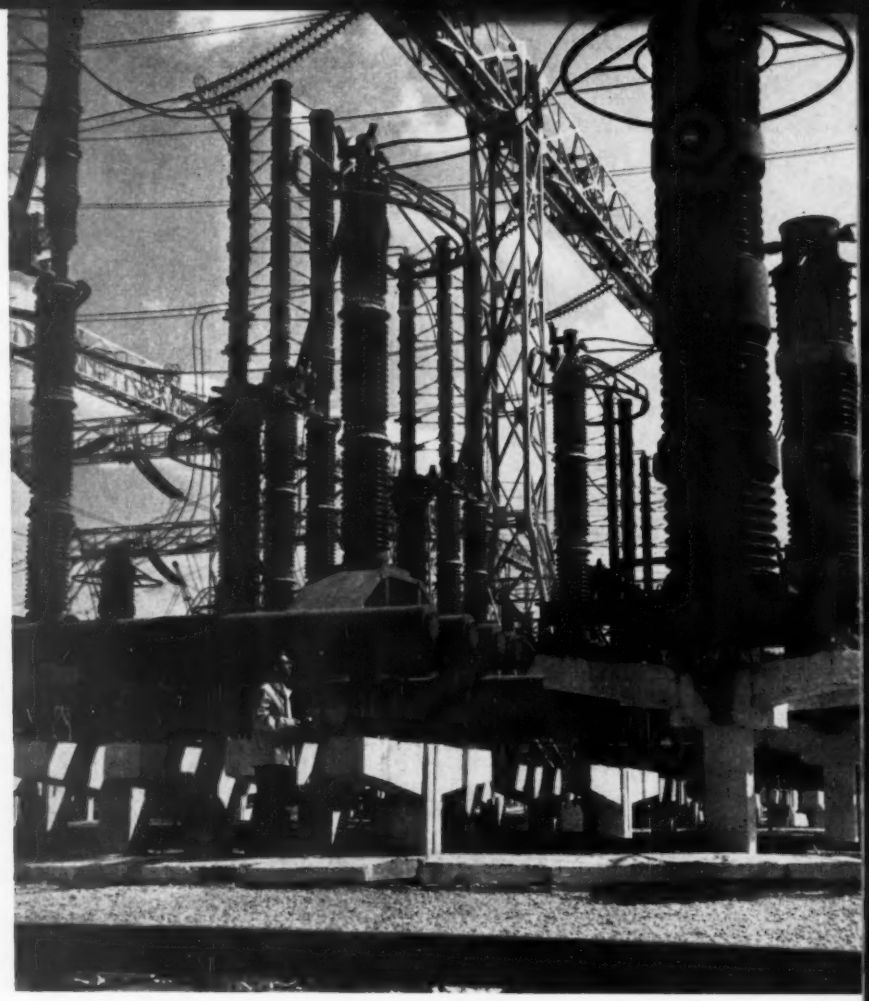
THE APPLIANCE SALES RECORD—1959

	Residential Customers	Refrigerators	Home Freezers	Ranges	Water Heaters	Washers Automatic	Washers Conventional	Dryers	Combination Washer-Dryer
ALASKA									
Alaska EL&P	2,701	...	...	...	...	...	...	...	...
Anchorage L&P Dept.	6,024	...	...	...	...	...	...	...	...
Chugach Electric Assn.	10,781	250	196	550	250	275	20	200	95
Matanuska Electric Assn.	1,445	23	28	11	32	26	17	15	3
ARIZONA									
Arizona PS	141,653	17,754	3,876	11,610	1,707	17,454	3,398	2,254	1,013
Mesa City Utilities	4,922	1,580	160	320	25	250	100	50	20
Salt River Power District	73,387	5,200	1,965	3,480	575	4,785	1,630	840	310
Tucson GEL&P	63,838	2,200	500	800	200	1,750	1,000	275	100
ALBERTA									
Calgary Power	50,000	...	...	...	...	...	...	...	...
BRITISH COLUMBIA									
B. C. Elec., Vancouver	246,944	12,042	2,763	8,466	5,190	7,393	1,438	5,856	...
B. C. Elec., Victoria	46,706	2,809	639	2,034	559	1,540	1,473	721	...
B. C. Power Commission	70,491	1,500	1,000	3,100	3,000	1,500	1,400	770	50
CALIFORNIA									
Alameda PU Dept.	14,411	275	125	400	5	300	50	300	50
Anaheim Dept. of LW&P	22,200	...	...	...	...	...	...	...	...
Burbank PS Dept.	31,220	290	15	120	10	285	60	150	36
California Electric Power	92,445	2,145	340	975	425	3,750	0	545	175
Calif.-Pacific Utilities	29,133	962	682	976	758	1,200	500	864	75
Glendale PS Dept.	44,109	...	...	730	...	...	...	...	...
Imperial Irrigation District	23,172	1,400	250	350	200	1,300	750	100	...
Los Angeles Dept. of W&P	758,376	59,000	8,768	6,214	1,630	52,759	2,790	5,260	...
Modesto Irrigation District	23,303	...	...	...	...	...	...	...	...
PG and E	1,572,610	113,000	41,000	78,000	15,600	120,000	...	50,000	14,600
Pasadena MU	42,997	...	...	629	50	...	...	...	...
Riverside PU Dept.	26,097	...	...	1,106	28	...	...	...	...
Sacramento MUD	134,044	14,935	3,666	12,794	2,591	...	...	8,830	2,474
San Diego G&E	268,316	28,675	7,150	10,160	2,500	27,000	2,690	2,855	1,575
Southern Calif. Edison	1,353,046	150,000	...	28,000	2,400	...	...	35,000	...
Turlock Irrigation District	17,316	...	...	...	...	...	...	...	...
COLORADO									
Colorado Central Power	30,397	500	350	2,400	...	400	250	700	200
Colorado Springs PU	37,905	...	...	...	...	...	...	...	...
Intermountain REA	3,307	53	18	77	42	29	...	32	4
Morgan County REA	2,635	...	...	...	...	...	...	...	...
PS of Colorado	271,886	26,200	6,000	8,100	2,000	23,400	4,000	10,300	2,900
Southern Colorado Power	41,601	2,002	440	868	217	2,380	867	484	281
HAWAII									
Hawaiian Electric	94,287	10,651	2,675	5,500	6,000	13,614	1,800	1,400	461
Hilo Electric	14,608	650	200	360	400	415	175	60	7
Lahaina L&P	1,265	...	...	...	...	...	...	...	...
IDAHO									
Idaho Power	111,474	6,411	5,337	9,171	6,946	12,000	...	6,073	600
Northern Lights	3,205	...	...	...	...	...	...	...	...
MONTANA									
Hill County Electric Co-op.	107	19	52	27	60	46	4	58	12
Montana Power	127,290	6,000	2,200	5,800	1,400	7,500	...	5,300	1,000
NEVADA									
Elko Lamoille Power	2,179	...	...	...	...	...	...	...	...
Sierra Pacific Power	36,542	...	...	...	...	...	...	...	...
Southern Nevada Power	28,277	1,984	509	1,304	1,340	2,250	215	296	187
NEW MEXICO									
Jemez Mountains Elec. Co-op.	4,065	...	...	...	...	...	...	...	...
N. M. Electric Service	9,569	786	550	182	0	746	96	165	74
PS of New Mexico	65,288	5,187	4,722	2,712	398	...	...	1,644	396
Raton PS	2,354	...	...	...	44	...	...	...	...
Roosevelt County Elec. Co-op.	1,805	35	51	29	18	69	4	29	8
OREGON									
California Oregon Power	74,349	3,136	2,443	4,099	3,193	4,960	...	4,524	656
Central Lincoln PUD	10,075	25	10	20	20	25	...	15	5
Eugene W&E Board	24,231	...	...	...	...	...	...	...	...
Pacific P&L	251,231	21,978	13,027	17,967	10,799	30,622	...	18,355	2,501
Portland GE	221,977	16,500	9,800	12,500	11,000	16,400	1,800	14,500	1,600
TEXAS									
El Paso Electric	82,463	9,041	3,176	3,470	3,625	0	0	1,319	...
Southwestern PS, N. M. Division	37,489	2,678	1,476	1,232	431	3,191	...	1,331①	...
UTAH									
Provo Dept. of PU	8,772	633	260	469	76	764	71	345	41
Utah P&L	203,588	13,051	6,971	14,776	4,513	17,168	4,279	7,245	1,348
WASHINGTON									
Benton County PUD No. 1	8,853	...	...	300	388	...	...	250	...
Benton Rural Elec.	3,109	...	...	...	...	...	...	...	...
Chelan County PUD No. 1	14,153	809	392	645	546	787	172	305	128
Clark County PUD No. 1	29,465	1,500	1,000	1,400	2,000	1,200	100	1,200	100
Cowlitz County PUD No. 1	18,827	934	1,307	981	2,804	2,270	237	1,691	...
Grant County PUD No. 2	10,680	...	...	...	...	...	...	...	...
Grays Harbor County PUD No. 1	17,959	...	...	525	525	...	...	417	...
Lewis County PUD No. 1	10,378	...	...	...	...	...	...	...	...
Mason County PUD No. 3	5,831	46	31	49	49	23	...	26	...
Pacific County PUD No. 2	6,075	225	75	250	250	400	150	350	10
Puget Sound P&L	196,828	9,500	...	10,000	9,500	11,000	...	7,500	1,000
Seattle City Light	207,872	20,000	...	13,000	15,000	15,000	...	12,000	...
Snohomish County PUD No. 1	53,945	3,000	1,000	3,000	3,000	3,000	1,000	1,800	200
Tacoma City Light	56,250	7,200	2,400	7,700	4,900	6,500	1,000	6,500	1,800
WYOMING									
Cheyenne LF&P	14,699	702	370	226	22	630	223	461	52
Mont.-Dak. Utilities	5,522	220	170	165	30	310	160	145	18

①Includes combination washer-dryer. ②From city records. ③From company records. ④Includes room conditioners. ⑤Less than 100. ⑥Distributor reports.

—FOR THE WESTERN STATES AND CANADA

Ironers	Dishwashers	Food Waste Units	Air Conditioners Room	Heat Pumps Central	Radios	Television	Appliance Sales Estimated	Appliance Sales Dealer Reports	
									ALASKA
...	...	...	...	...	...	...			Alaska EL&P
...	...	...	...	...	...	...			Anchorage L&P Dept.
20	60	40	...	...	145	200	X		Chugach Elec. Assn.
1	2	0	0	0	104	35		X	Matanuska Elec. Assn.
									ARIZONA
135	2,682	2,204	3,420	1,122	21,552	26,332		X	Arizona PS
40	300	1,000	400	200	1,500	1,500	X		Mesa City Utilities
105	860	950	...	1,238	...	...	X	X	Salt River Power District
100	350	150	250	10	2,500	3,000	X		Tucson GEL&P
									ALBERTA
...	...	...	...	...	...	...			Calgary Power
									BRITISH COLUMBIA
71	890	295	⑤	...	16,283	17,037	X		B. C. Elec., Vancouver
5	59	43	10	...	3,257	4,233		X	B. C. Elec., Victoria
50	200	200	30	0	5,000	3,000	X		B. C. Power Commission
									CALIFORNIA
50	150	150	...	1	400	500	X		Alameda PU Dept.
...	...	...	...	...	...	...			Anaheim Dept. of LW&P
12	52	210	265	8	310	675	X		Burbank PS Dept.
...	425	...	3,000	294	...	...		X	California Electric Power
65	...	375	320	10	...	2,500	X	X	Calif.-Pacific Utilities
...	...	...	...	...	...	...			Glendale PS Dept.
...	...	...	2,000	...	...	...	X		Imperial Irrigation District
...	...	...	11,697	...	...	83,079	X	X	Los Angeles Dept. of W&P
...	...	...	...	...	...	...			Modesto Irrigation District
...	38,000	43,500	16,200	1,250	146,000	166,000	X	X	PG and E
...	...	...	...	...	...	...	X		Pasadena MU
...	...	...	...	21	...	...		X⑦	Riverside PU Dept.
...	5,350	7,342	9,637	75	...	20,742		X	Sacramento MUD
...	3,830	9,000	...	...	64,750	45,275		X⑥	San Diego G&E
...	24,000	...	...	1,062	...	200,000	X		Southern Calif. Edison
...	...	...	...	...	...	...			Turlock Irrigation District
									COLORADO
...	50	150	...	...	...	...	X		Colorado Central Power
...	...	...	...	...	...	...			Colorado Springs PU
8	27	27	11	12	36	31	X		Intermountain REA
...	...	...	...	...	...	...			Morgan County REA
1,200	7,000	4,700	1,500	...	...	74,000	X		PS of Colorado
63	147	720	261	1	...	2,700	X		Southern Colorado Power Co.
									HAWAII
.	1,571	1,500	400	1	...	11,000	X	X	Hawaiian Electric
...	65	50	25	...	700	750	X	X	Hilo Electric
...	...	...	...	...	...	...			Lahaina L&P
									IDAHO
2,200	1,200	1,500	120	5	9,000	14,000	X	X	Idaho Power
...	...	...	...	...	...	...			Northern Lights
									MONTANA
57	62	21	...	...	26	50	X		Hill County Electric Co-op.
...	1,600	...	500	...	...	18,000	X		Montana Power
									NEVADA
...	...	...	...	...	...	...			Elko Lamoille Power
...	...	...	...	...	...	...			Sierra Pacific Power
96	286	296	138	1,242	3,359	3,553		X	Southern Nevada Power
									NEW MEXICO
...	...	...	...	...	...	...			Jemez Mountains Elec. Co-op.
7	62	...	49	1	...	1,322		X	N. M. Electric Service
897	640	803	300	3	...	9,036		X	PS of New Mexico
...	...	...	...	...	...	300		X	Raton PS
1	4	...	5	4	25	64	X	X	Roosevelt County Elec. Co-op.
									OREGON
...	1,540	...	1,085	...	...	...	X	X	California Oregon Power
10	10	...	...	3	50	50	X		Central Lincoln PUD
...	...	...	...	...	...	...			Eugene W&E Board
506	4,109	1,555	2,343	...	26,929	30,586		X	Pacific P&L
...	4,500	...	1,500	38	...	20,000	X		Portland GE
									TEXAS
0	1,145	...	642	79	0	14,796		X	El Paso Electric
52	620	...	238	16	...	4,999		X	Southwestern PS, N. M. Division
									UTAH
36	107	171	58	0	662	801		X	Provo Dept. of PU
1,509	3,793	5,730	146	6	19,092	17,997		X	Utah P&L
									WASHINGTON
...	...	...	372	...	...	...		X⑤	Benton County PUD No. 1
...	...	...	...	...	...	...			Benton Rural Elec.
19	173	151	128	3	589	620	X		Chelan County PUD No. 1
100	300	200	100	...	1,700	2,000	X		Clark County PUD No. 1
...	288	154	63	5	...	2,515		X	Cowlitz County PUD No. 1
...	...	...	...	...	...	...			Grant County PUD No. 2
...	...	...	...	...	...	...		X⑤	Grays Harbor County PUD No. 1
...	...	...	...	...	...	...			Lewis County PUD No. 1
...	7	...	...	...	...	30	X		Mason County PUD No. 3
35	60	25	...	1	500	350	X		Pacific County PUD No. 2
...	...	...	...	...	...	15,000	X		Puget Sound P&L
...	5,000	...	...	...	...	...	X		Seattle City Light
250	1,200	400	15	5	2,000	3,000	X		Snohomish County PUD No. 1
...	1,950	2,100	600	25	...	12,000	X		Tacoma City Light
									WYOMING
42	106	139	26	...	1,774	1,151	X		Cheyenne LF&P
48	65	65	40	0	430	680	X		Mont.-Dak. Utilities



The switchyard at the Volga hydroelectric station

S. ROKOTYAN, CHIEF ENGINEER
LONG DISTANCE DEPARTMENT
THERMAL POWER DESIGN INSTITUTE

A paper by the Russian designer; questions and comments by an American transmission expert combine to make this the most penetrating discussion of Russian EHV practices in the English language

THE KUIBYSHEV-MOSCOW 500-KV LINE

Moscow receives electrical power that is transmitted over a 400-km (250-mile) power line from the 2,300,000-kw Volga hydro station near Kuibyshev.

The design transmitting capacity in the initial stage was 1,150,000 kw, but this was increased later to 1,350,000-1,400,000 kw, while still later this figure will rise to 1,800,000 kw. In 1959 the maximum actual transmitting capacity reached 1,300,000 kw. Approximately 20 billion kwh of cheap power have been transmitted to Moscow over the 400-kv line during its three-year exploitation period.

The construction of the Kuibyshev-Moscow power line was begun in 1952. The first channel (*circuit*), including the step-up substation at the hydro station, two parallel air lines (*bundled conductors*) about 900 km (559 *miles*) long, three switch points (*intermediate switching stations*) and two input (*receiving*) substations in Moscow, was put into action in the spring of 1956. In 1958, two more input (*receiving*) substations for the 400-kv line were constructed and axial (*series*) capacitance compensation was initiated.

The achievement of a 600,000- to 750,000-kw carrying capacity for each channel (*circuit*) over a 400-kv line 900 km long is a quite difficult technical accomplishment. The following steps were taken to solve the ensuing problem: (1) the usage of fast-acting electronic excitation regulators for synchronous units; (2) the splitting (*bundling*) of the transmission line wiring; (3) the usage of axial (*series*) capacitance compensation, the installation of synchronous compensators (*condensers*) at the input (*receiving*) substations; (4) the installation of shunt reactors at the switch points and at the step-up substation.

Transmission Design

The 400-kv air (*overhead*) line includes two parallel chains (*circuits*), each of which is mounted on separate portal-type supports (*towers*) with the phases being lined parallel to each other. For technical and economical reasons, both chains (*circuits*) are not hung from the same support.

Aluminum-steel conductor with aluminum cross-section of 480 mm²/54 wires, each with 3.37 mm diameter/ and steel section cross-section 59.7 mm²/19 wires with 2 mm diameter/ are employed in the lines.

The outside diameter of the conductor is 30.2 mm (1.19 *in.*). 1 km of such wire weighs 1,815 kg.

Each phase consists of three such conductors, placed so as to form an equilateral triangle with each side being 400 mm (15¾ *in.*) long.

The conductors are held by chains (*strings*) of 22 porcelain plate-type suspension insulators, each being 185/mm (7.3 *in.*) high, with a 300 mm (11.8 *in.*) diameter and test load of 8.5 tons. The conductor is fastened to the chain (*string*) with the aid of a specially developed clamp which has been tried on a testing-stand. Dampers have been installed to quench vibrations. The distance between parallel conductors in each phase is fixed with the aid of spacers.

The anchoring chain (*insulator*) for the anchor (*dead-end*) and corner (*angle*) supports consists of three chains (*strings*) in parallel, each with 22 insulators 210 mm (8¼ *in.*) high, with 350 mm (13.8 *in.*) diameter and test load of 11 tons. The insulator chains (*strings*) are shielded on the side facing the line conductor.

Welded constructions using open-hearth steel with tensile strength of 3,900-4,000 kg/cm² are used in the line supports (*towers*).

The intermediate supports (*tangent towers*) are the portal type, being characterized by height to chain (*insulator string*) connection point of 27 meters (88.7 *ft*), weight of single support—7.27 tons, height of whole support – 29.5 meters (97 *ft*), length of crossarm – 21 meters (69 *ft*), distance between phases—10.5 meters (34.5 *ft*).

The anchor (*dead-end*) and corner supports (*angle towers*) are the bar type (*see photo*) with: height to chain connection (*insulator support*) point—22 meters (72.3 *ft*), full height of support—26.9 meters (88.4 *ft*). The weight of the anchor-corner supports varies from 19 to 29 tons depending on the angle at which the line is turned.

The foundations for the intermediate supports (*tangent towers*) are made of metal sections placed on concrete plates, molded concrete and cast concrete blocks. The foundation for the anchor-corner supports are made of molded concrete and cast concrete plates.

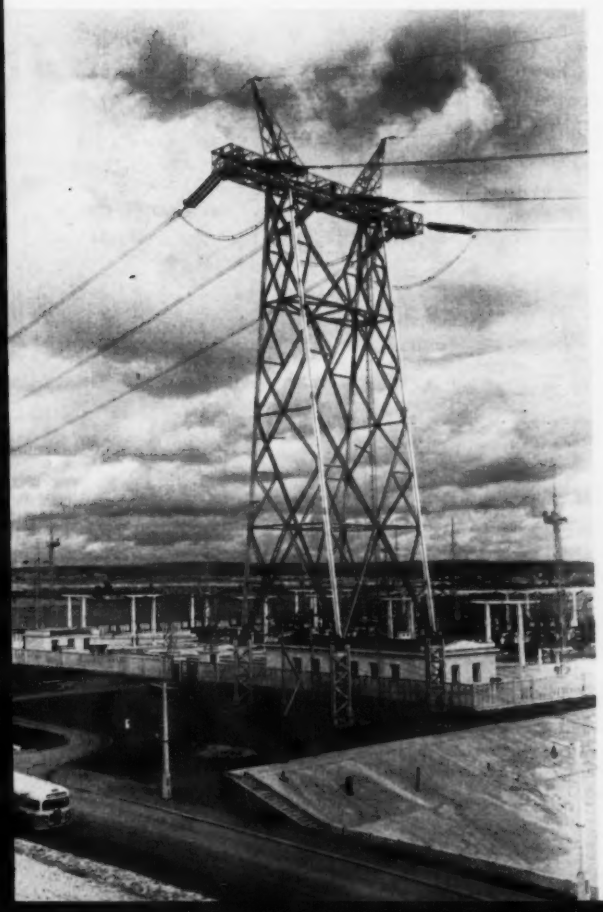
During the construction of the line, up to 700,000 cu m of earth have been dug up, up to 200,000 cu m of concrete installed, 50,000 tons of metal elements and 35,000 tons of conductors and cables installed.

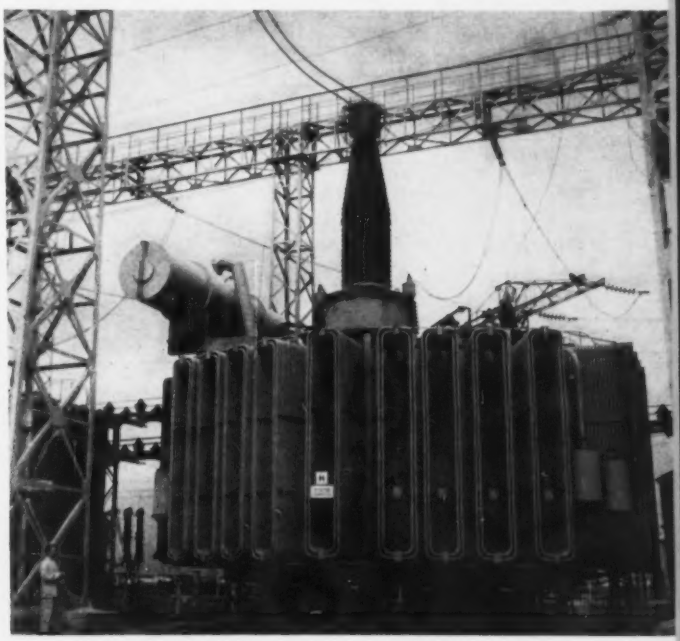
Receiving Substations

The input (*receiving*) substations around Moscow are all wired identically and each is equipped with two groups of single-phase 400/110/11-kv transformers (or autotransformers) each having 270,000 kva /3x90/ and two groups of 220/110/11 kv transformers each having 180-240,000-kva output.

In addition, four synchronous compensators (*condensers*) with hydrogen cooling are set up in the open-air at each substation. A group of single-phase 400/220/11-kv autotransformers with 500,000-kva output are installed at the Vladimir intermediate substation.

The 400- and 220-kv transformer groups are equipped





Above: Russian power transformer in the Noginsk substation on the Kuibyshev-Moscow line

Left: Russian River crossing tower appears to have three-wire bundles. Sub below has tapered beam structures rather than conventional lattice structures

with devices for controlling the voltage ratio of the loaded transformers in order to improve the voltage regulation conditions.

The 400-, 220- and 110-kv distribution units are the open type with flexible bars (*strain bus*).

Switching Stations

Switching points have been set up at various points along the line to permit the channels (*circuits*) to be connected with each other and to make it possible to divide the line into separate sections.

The switching points are wired in accordance with a rectangular diagram. Step-down transformers and open 220- or 110-kv distribution units may be installed at each point.

The largest axial (*series*) capacitance compensation unit in the world with a 486-mvar power limit was installed on the Kuibyshev-Moscow power line in 1958. This unit has been inserted at the middle switching point and consists of three batteries of static oil-filled-paper capacitors connected in parallel. The power of each capacitor is 50 kvar, voltage—600 v, current—83.3 amp, capacitive resistance—7.2 ohms. Each phase of one battery consists of nine capacitors connected in parallel and 120 connected in series.

The capacitors (see photo) are placed on 135 metal platforms, which are insulated from the earth for voltages up to 400, square root of 3 kv.

Each platform is hung by four insulator chains (*strings*) from the plungers of the steel portals.

The axial (*series*) compensation unit is equipped with all necessary commutation and protection equipment: dischargers, which shunt the batteries in case of excessive currents, and means for automatic arc quenching with blast of compressed air.

All of the equipment for the 400-kv power line has been produced in electrotechnical factories in the USSR.

The design current for all the line equipment (switches, disconnectors, current transformers, etc.) is 2,000 amp.

The 400-kv breaker is an air type with a 15 million kva breaking capacity.

The transmission line is equipped with up-to-date relay protection, telemechanisms and communications.

The insulation level of the 400-kv system was determined by the following preliminary data:

—The zero (*neutral*) point of the 400-kv winding on the power transformers is grounded
—The maximum line operating voltage is 420 kv
—The transmission lines along their whole length are protected from direct lightning strikes by two cabled lightning conductors with a 20° protection angle
—The 400-kv substation is protected from direct lightning strikes by lightning rod conductors
—The substations are equipped with valve dischargers (*lightning arresters*)
—The level of inner overvoltages (switching surges) does not exceed the nominal phase voltage by more than three times

Increase to 500 Kv

The experience gained during the design and exploitation of the Kuibyshev-Moscow line has made clear the possibility of increasing the line voltage from 400 to 500 kv, which in turn will increase the carrying capacity by 40%.

The insulation level of the line itself and of the equipment in the substations for such long-distance transmission of extra-high voltages is determined by the inner overvoltages (*switching surges*). If the insulation of the Kuibyshev-Moscow line was determined by inner overvoltages exceeding the nominal by three times (moist discharge test voltage of 700 kv) then by lowering the inner overvoltage level to 2.5 times, and keeping the test voltage value 700 kv the same, the operating voltage can be raised from 400 to 500 kv with the same insulation.

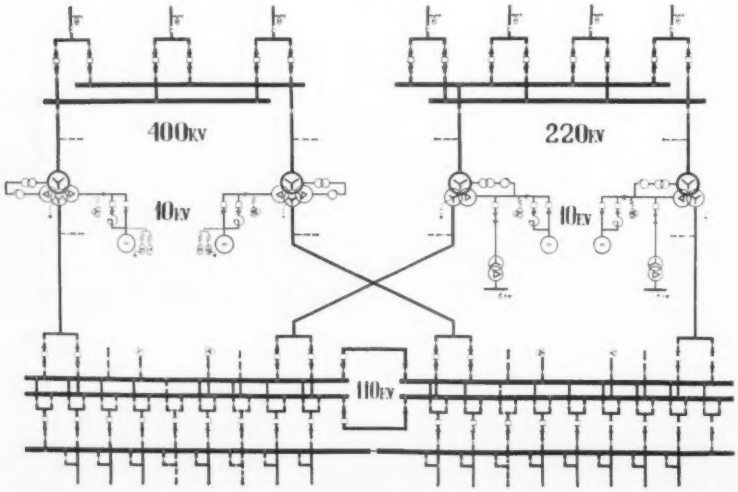
This procedure is to be accomplished in the near future as the load on the Kuibyshev-Moscow line will increase.

The being-built Stalingrad-Moscow line is to provide a carrying capacity of 1,500,000 kw two channels (*circuits*) from the very beginning, so it is being built with a 500-kv operating voltage in view.

During 1958, for the first time on the Kuibyshev-Moscow line, lightning dischargers (*arresters*) switched (*operated*) out twice.

Three times the line was switched out due to the jumping (*galloping*) of the wires as a result of the combined action of wind and ice.

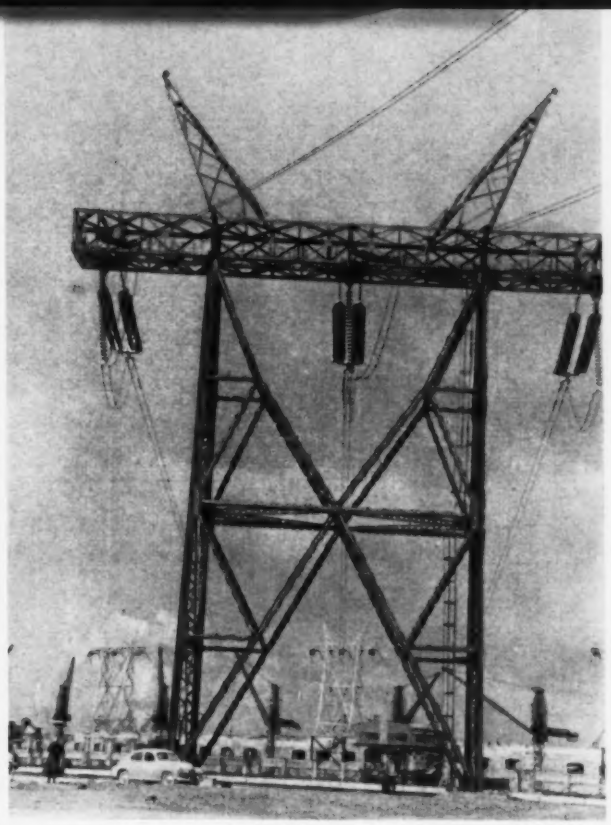
The three-year experience gained by the exploitation of the Kuibyshev-Moscow line, the first Soviet 400-kv



Editor's Note: **The editors express their gratitude to Pacific Gas and Electric's W. R. "Bill" Johnson for his assistance in preparing the questions and comments that appear at the end of the paper. It is in this discussion that we get the best view of the Russian designs. The paper has been printed as it was received. Italicized comments have been inserted in the body of the paper to help the reader.**

One-line diagram, left, shows the circuit arrangement of the receiving substation. Notice that the scheme has the power flowing through the 110-kv system to the 220-kv system

Right: the complete transmission scheme as applied to the Kuibyshev-Moscow high-voltage line



Transmission tower near the dam site shows tower design. At this point a two-conductor bundle is being used

transmission line, showed the high reliability of the line itself, as well as of the substations' equipment.

• Questions • Answers • Comments

Question—Why has the power limit of the Kuibyshev-Moscow line been set at 1,150,000 kw for the initial stage and at 1.8 million kw for a later stage?

Answer—Under Soviet regulations for long distance twin circuit a-c transmission lines with switching stations, steady state stability must be maintained, no matter whether all the sections of line are operative or one of the parallel circuits is out of service due to a short circuit. In such cases, transmission lines should be operated at 15% and 5% the power limit, respectively. This takes into account the effect of high speed, low inertia electronic field regulators maintaining the terminal voltage of hydrogenerators constant.

Another condition is transient stability in case there is a single-phase to ground fault in any part of the 400-kv line. The faulty line should be tripped out for not more than 0.1 to 0.12 second (both by relays and air circuit breakers). Transient stability should also be maintained in case there is a two-phase to ground fault in any part of the 400-kv line. To this end, special measures may be resorted to, such as load resistors connected across the 400-kv buses of hydro power stations for a few tenths of a second to brake the hydrogenerators.

In keeping with the above requirements, the power limit of the Moscow-Kuibyshev line has been set at 1,150,000 kw for 400-kv transmission voltage and 25% regulation by axial capacitance compensation. After the line will have been switched over to 500 kv, its power limit will be raised to 1.8 million kw to match its steady state and transient stability limits.

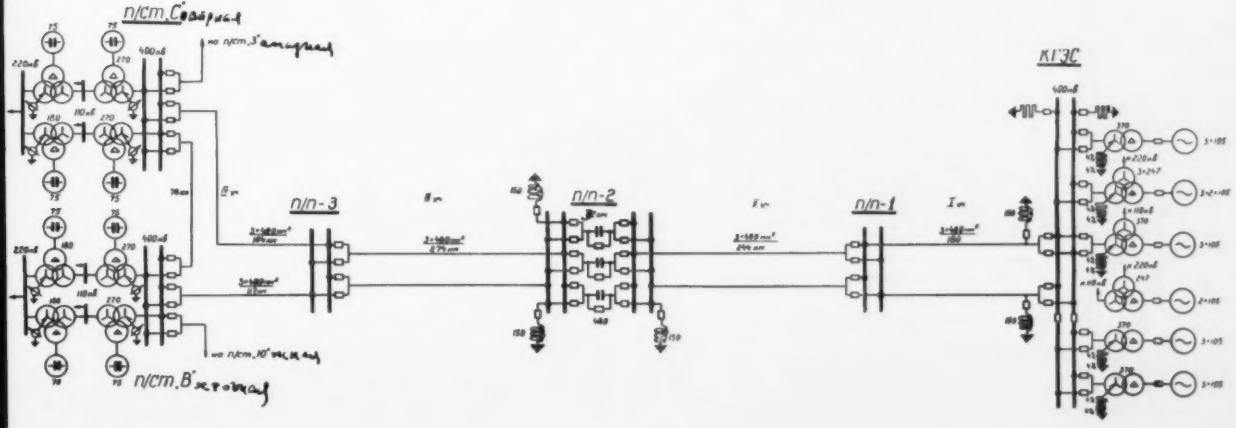
Comment—The two Kuibyshev-Moscow 400-kv lines are 506 miles and 553 miles in length, respectively, and are sectionalized at three intermediate points. Since the Soviets' as well as other European systems are 50 cycles, the lengths of these lines from a stability standpoint are only five-sixths as long as if operated at 60 cycles. Thus we are considering a system roughly equivalent to 450 miles.

Apparently the power limit of 1,150,000 kw for the two lines is based upon at least a 15% margin under the steady state limit with both lines in, and at least a 5% margin with one line section (roughly 110 miles) out of service. The steady state limit is based upon operation in the dynamic stability region, and with the lines compensated 25% by serious capacitors.

The transient stability limit is based upon riding through either a single-phase to ground or a two-phase to ground fault. Resistance loading of the sending end generators is used to help hold these machines in step.

Q—Can the axial capacitance compensation unit reclose after a fault has been eliminated?

A—Yes, it can. This unit has an air blast break switch. After a fault has been remedied, a blast of compressed air quenches the arc in the gap, and the unit is able to operate again.



C—Re-insertion of the series capacitors after the fault is cleared, but not for part cycles during the fault, seems to be the practice for this installation.

Q—What factors have governed the calculation of electric dimensions on the supports of the 400-kv line?

A—Three sets of conditions have been taken into account: (1) Atmospheric overvoltage; wind, 10 meters per second (22.4 *mph);* clearance from the wires or the grading shield of a insulator string to the steel elements of a support not less than 350 cm (137½ in.); (2) internal overvoltages with an amplitude three times that of the operating voltage; wind, 16 meters per second (35.8 *mph*). Clearance from the wires or the grading shield of an insulator string to the steel elements of a support not less than 260 cm (102 *in.*); (3) a voltage 50% higher than the operating voltage of the line; wind, 25 meters per second (55.8 *mph*); clearance from the wires or the grading shield of an insulator string to the steel elements of a support, not less than 100 cm (39.3 *in.*)

In computing the insulator swing due to the wind, account has been taken of the possibility of supports being located at different elevations with the resulting differences in wind load and vertical weight between spans.

Accordingly, with a suspension insulator string 500 cm (196 *in.*) long and the horizontally arranged phases on gantry-type supports, the phases are spaced at not less than 10.5 meters (34.4 *ft*).

C—It is of considerable interest to note the design air gap clearance to ground of 350 cm (137½ in.). This is quite comparable with values being discussed in this country for the 460-kv range; however, the value of 100 cm (39.3 in.) for the maximum wind condition seems quite low.

Q—What is the normal and maximum tension of the conductors?

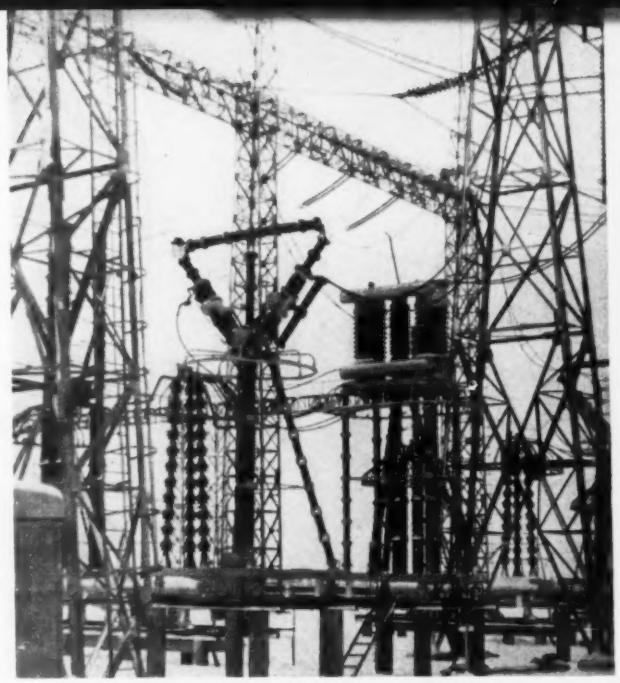
A—The normal tension of the conductors under average operating conditions (no glaze or wind at 4 C) is 6.1 to 7 kilograms per square centimeter.

C—*(See following comment.)*

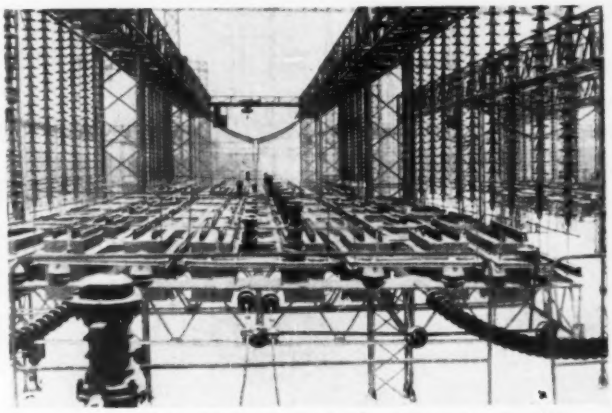
Q—What is the breaking strength of the conductors?

A—The breaking strength of steel-aluminum wire grade ASO-480 is 14,370 kg.

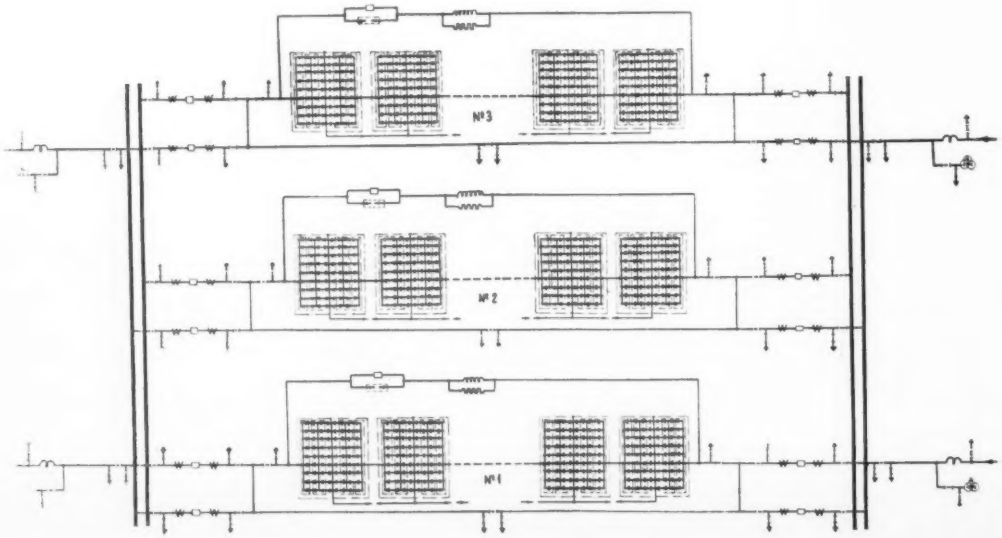
C—One would have to convert these values to per



Shunt reactor, left, and damping device, right, form a part of the series capacitors



A general view of one phase of one circuit of the series capacitor section. Notice that capacitor racks are suspended



Series capacitance circuit diagram

cent of ultimate strength to be more readily understandable and comparable with our practices.

Q—Why is there no direct 400-to-220-kv transformation at the Moscow stepdown transformer stations?

A—The 400-to-110-kv transformation has been chosen for the economic reason of reducing power losses, which would be otherwise inevitable due to two-step transformation, as the bulk of load is in a 110-kv network. Some large power stations in the receiving system are switched to a 110-kv network. The more remote stations are brought into a 220-kv network. On the whole, the 400-to-110-kv transformation does not hamper the stability of the system in the least.

C—This is an interesting point, and a reasonable explanation.

Q—What is the arrangement of the axial capacitance compensation on the line?

A—These facilities are located at the intermediate switching station. They are divided into three identical parallel circuits, each of which is connected via two 400-kv breakers to the West and East bus systems of the switching station. There are no other devices at the 400-kv potential in addition to the capacitors.

The shunt reactor in each circuit and its air blast switch are mounted on the ground.

Should a fault occur in one of the circuits or scheduled maintenance be performed on it, the remaining two circuits should be able to carry the whole of the load both in terms of current and capacity reactance.

To take care of the current surges occurring when the banks of static capacitors are bridged, a damping arrangement consisting of an ohmic and an inductive resistance connected in parallel is brought in series with the air blast switch.

In case one of the parallel circuits of the line should be tripped out anywhere between switching stations, the carrying capacity of the line can be automatically increased through an increase in the capacity reactance of the capacitor bank by tripping out one of the circuits of the axial capacitance compensation unit. This is also done automatically (see the accompanying diagram).

C—The explanations and details of the series capacitor installations should be quite interesting to engineers considering design of this type of equipment. The suspension support of the capacitor units follows the Swedish practice.

Q—Has the axial capacitance compensation unit increased switching overvoltages compared with a decompensation line?

A—Yes, it has. It accounts for 25 to 30% increase in internal overvoltage. To make it easier for the breakers to clear faults the unit is automatically shunted by the air blast switch, until the breaker has tripped out the faulty section of the line.

C—This answer should be of considerable interest for those who are selecting switching surge criteria for transmission design purposes.

Q—Will there be similar compensation units in the 500-kv Stalingrad-Moscow line?

A—The power limit of the 500-kv Stalingrad-Moscow line is 1.5 million kw. Should the need arise in a higher power limit for the line, provisions have been made in two intermediate substations for the accommodation of such units.

Q—Can you say anything about wire jumps?

A—We have just started a study into wire jumps on the 400-kv line. Therefore, no ample information is available on the matter yet, nor can any recommendations be made as to practical measures eliminating the phenomenon, the more so that wire jumps have been observed under a wide range of conditions.

C—The interesting comment here is that "wire jumps" (galloping conductors) have been observed under a wide range of conditions.

Q—Do you use automatic reclosing facilities on the 400 kv line?

A—Yes, we do. A high-speed, single-phase reclosing facility has been operating on the Kuibyshev-Moscow line since late 1958.

C—It is quite significant that they report the use of high-speed single-phase reclosing.

Q—What is the least clearance of the wires from the ground?

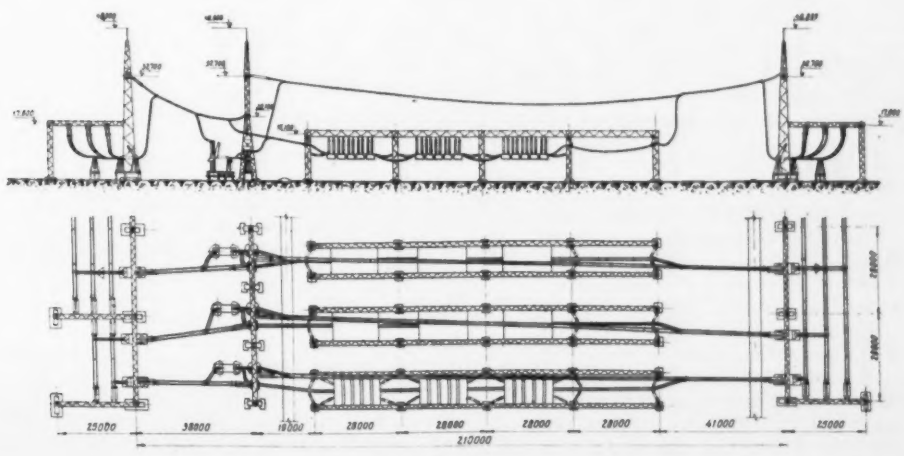
A—At +40 C maximum air temperature, the clearance of the wires from the ground should be not less than 8 meters.

C—Eight meters ground clearance equals 26.2 ft.

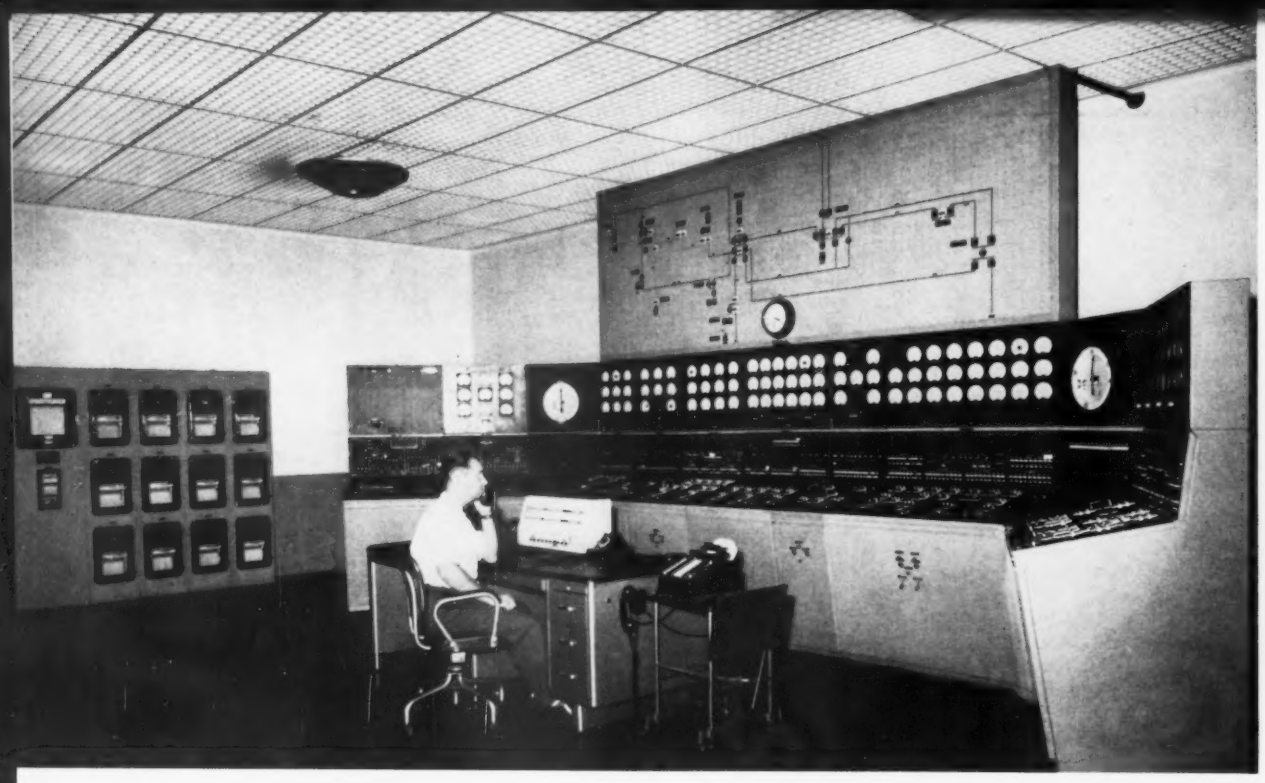
Q—What is the optimum air temperature for the electric distances on the supports?

A—At atmospheric overvoltages, the spacing has been computed for +15 C air temperature, while at internal overvoltages and the operating voltage, it is −5 C.

(Note capacitor banks are suspended from structure. See photo on opposite page)



Side elevation and plan of one circuit of the series capacitance unit



Representatives of two of the West's most automated power systems describe the . . .

Economics of Centralized Control

G. F. GREEN, ASSISTANT CHIEF ENGINEER, B. C. ELECTRIC CO.
T. D. STANLEY, PRODUCTION SUPERINTENDENT, CALGARY POWER LTD.

In an effort to control rising prices, the management of a public utility operation must explore all possible economies.

Of particular interest during the past decade has been the progress in the automation of power production facilities. This type of cost saving is particularly applicable to a utility operation functioning as it does around the clock. Any capital spent to increase production per man-hour is effective for approximately 8,760 hours per year compared with approximately 2,080 hours per year for a single-shift industrial operation.

Centralized control was first applied commercially in the early 1920s. The economic pressures of the past 12 years have caused a considerable increase in interest. Centralized control is the process by which the operation of a number of electric stations can be controlled from a central dispatching point that may be many miles distant from the stations. Using this technique a considerable saving in operating personnel can be realized. To determine the conditions under which centralized control can be economically applied it is necessary to balance this man-hour saving against the capital cost of the additional plant facilities required for the remote operation.

The annual cost involved in staffing one operating position must be considered. It is difficult to arrive at a single figure that could be widely applied because of the great variation in wage rates, fringe costs, housing and other intangible expenses. However, the annual cost of maintaining one operator under conditions prevailing in Western Canada will range from $5,800 to $8,000. Each operating position requires 168 hours of attendance per week. On the basis of a 40-hour week this necessitates the employment of four to five men at an annual cost ranging from $23,200 to $40,000. Capitalizing this at 12.5% we arrive at a figure between $185,000 and $320,000. Thus, it would be economical to make a capital expenditure of at least $185,600 to save one operating position.

The application of automatic, remote and supervisory control to the Calgary Power hydro system has been carried almost to the ultimate in that 10 of its 11 plants, along with one major and two minor pump stations, are controlled from one room. The eleventh plant, Bearspaw, is automatic, and actually controlled from the Southern Transmission and Distribution Trouble Headquarters in a room remote from the actual switchboard in the Bearspaw plant. From a manpower standpoint this plant is the same as if it were controlled from the control center, because the trouble headquarters is an established operating point irrespective of the control of the plant.

Fig. 1 shows the layout of the company's hydro system, indicating the geographical grouping of the plants and roughly the distance between them. Also shown in squares is the number of men required to operate and maintain the plant, or

Published with permission of Canadian National Committee, World Power Conference, Ottawa, Canada.

group of plants, on the system as it exists at present.

A study of this system will illustrate all the basic principles that affect its cost and manpower savings because of the varied nature and locations of the plants. It is a basic principle of automatic remote control that the cost is a function of the number of units to be controlled, rather than the number or size of the plants. In other words, it costs virtually as much to remote control a small unit as a large one, or to automatize a multiple-unit plant as against the same number of single unit plants. The saving in manpower in a multiple-unit plant is much less per unit than in a single-unit plant, and where these single-unit plants can be handled in groups by a common staff the saving can be even greater. It is very obvious to anyone studying the staffs, as indicated in Fig. 1, that the staff required is appreciably less than that which would be required if all these plants were manually operated. The actual saving in manpower resulting from remote operation was 40 men.

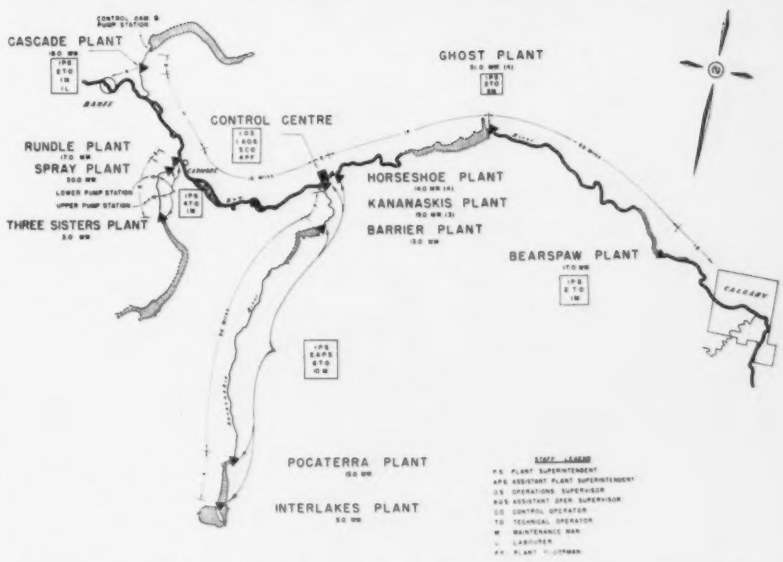


Fig. 1—The layout of the Calgary Power hydro system. Legend gives capacities and staffs in boxes

It is essential that a plant must first be made automatic before it can be remote and supervisory controlled, and Table I gives the costs of supplying and installing automatic equipment for each plant. These costs have been broken down to indicate their components. The first column indicates the cost of the switchboard equipment, which is normally mounted as an extension to the standard switchboard. Next is shown the cost of additional equipment on the governor to make it automatic. Under the heading "sensory devices" are such things as thermostats, bearing temperature indicators, level devices, which range from the accumulator tank oil levels to forebay levels, tailrace levels and even hydraulic gate positions. There are many countries where the cost involved in special ventilating equipment would not be required, but where our yearly range of temperature is from 33 C to minus 43 C, special provision for automatic louvers and ventilating fans under thermostatic control is required. Whether or not automatic features are required for penstock valves is, of course, a special feature of each plant, as is also the amount of substation equipment associated with any one plant.

Referring to Table II, a summary is given of the total costs for remote and supervisory control, including cost of automation for each plant; also included is the capacity of each plant and the number of units in each plant. The cost of achieving this for any unit is relatively uniform, excepting insofar as it is af-

TABLE I—COST OF PROVIDING AUTOMATIC OPERATION OF GENERATING STATIONS

	Cost of Extra Devices Required for Automatic Operation									
Plant	Swbd.	Gov.	Sensory Devices	Ventil. Eqpt.	Penstock Valve	Substn.	Wiring Fittings	Total Automatic Material	Labor Engineering and Overhead	Total Automatic
Barrier	$ 4,000	$ 2,500	$ 1,100	$ 2,000	$	$	$ 500	$10,100	$ 3,900	$14,000
Cascade	4,500	4,975[1]	1,150	2,760	4,160	....	500	18,045	7,655	25,700
Spray	4,000	2,000	1,150	....	4,500	....	750	12,400	4,300	16,700
Bearspaw	7,000	2,000	1,200	2,500	....	....	1,000	13,700	4,500	18,200
Kananaskis	4,000	2,000	1,150	1,500	....	....	750	9,400	3,800	13,200
Rundle	6,000	2,000	1,150	1,500	....	....	750	11,400	4,200	15,600
Three Sisters	4,000	2,500	2,150[3]	4,400	....	....	500	9,550	3,250	12,800
Ghost	27,500	8,000	4,500	9,000	....	21,000[4]	6,000	76,000	18,000	94,000
Horseshoe	27,500	12,000[2]	5,800[3]	3,600	....	21,000[4]	4,000	73,900	16,400	90,300
Pocaterra	6,000	2,500	1,500	2,200	1,000	....	800	14,000	4,600	18,600
Interlakes	5,000	2,500	1,500	1,500	....	....	600	11,100	3,500	14,600

1. Including PMG.
2. No PMG.
3. Including speed switches.
4. Six breakers with automatic synchronizing.

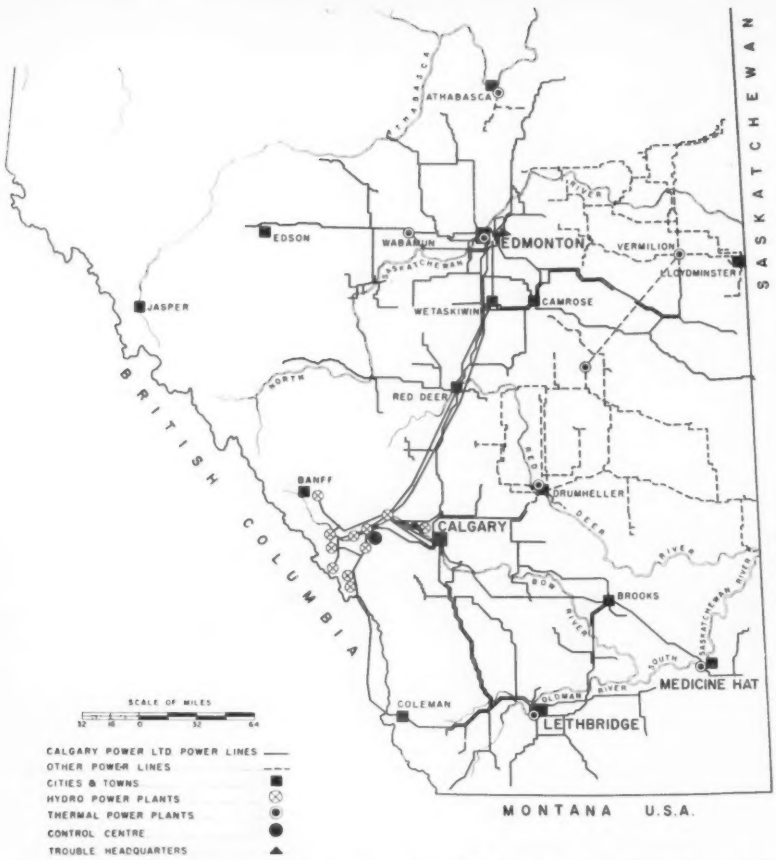


Fig. 2—Calgary Power's transmission system with 4,895 line miles over 13 kv. Seven shift positions operate systems

fected by the basic factors outlined above.

All above supervisory costs include both the equipment at the control center and at the plant. However, there are certain features at the control center that are peculiar to that place alone and they are listed in Table II. The electric map, totalizing metering and load controller could well be called operating aids, but are essential to achieve all the tangible and intangible benefits that are possible by centralized control.

This investment of $818,500 made possible a saving of 40 men. Based on 1957 wage rates the cost per man, including fringe benefits and housing, was $7,920 per year. As the saving in manpower has amounted to 40 men, this makes a total saving of $316,800 per year. The annual fixed charges on the capital required, based on 12½%, are $102,300. This makes a net saving of $214,500. The total operating and maintenance budget for this group of 11 plants for the year 1957 was $448,000. Thus we see that operating costs are 32.4% less than they would have been in a manual system. It might be noted that as far as capital requirements are concerned, a saving of some $400,000 was made on housing, which would have been built for employees in a manual system, and this cost is included in the cost per man.

Calgary Power's transmission system is shown in Fig. 2 and it can be seen that it is a very widespread and scattered system containing some 4,895 miles of transmission lines of 13.8 kv and over, with a load of some 395 mw. Without going into all the economics of automation as it applies to the system, it is enough to point out that this system is operated by only seven shift positions, as follows:

One control center operator and one Kananaskis plant floorman who can assist the control center operator if required.

One southern transmission and distribution trouble headquarters operator situated at the Bearspaw plant adjacent to Calgary.

One northern transmission and distribution trouble headquarters operator situated in its East Edmonton substation.

One steam engineer and two assistants in its 144-mw Wabamun steam plant.

The application of automation to the Calgary Power's system has been in use for sufficient time to prove that it is entirely practicable and reliable, and because of the very obvious saving has produced large economies in operating costs.

The Mainland hydroelectric generating system of the B. C. Electric Co. consists of 12 stations with a presently installed capacity of 841 mw, including eight automatic stations. All but one of these automatic stations are supervisory controlled (see ELECTRICAL WEST December 1958, p 84).

The total operating staff for 12 generating stations and 21 major substations consists of 50 men. If the seven remotely controlled generating plants were manually operated an additional 62 men would have been required. Because of the remote location of most of the plants, it is estimated that an additional 59 houses would also have been needed. The annual cost of this additional staff and housing would have been at least $440,000. Assuming fixed charges at 12½%, a capital outlay of $3,520,000 would be justified to provide remote control or approximately $500,000 per station. The capital cost of providing this type of control has been shown to be much less than this figure. Thus under conditions existing in Western Canada the remote operation of generating stations represents a substantial cost saving.

In 1959 a gas turbine generating station with four 25-mw units went into operation. An interesting feature of this plant is that fully remote operation is possible from the Vancouver control center.

Since centralized control is usually considered only for hydro plants, a short description of the principal features of this application will be given. The supervisory control equipment for the station is conventional and includes facilities for telemetering, alarms, starting and stopping the generating units, operating circuit breakers and controlling power and reactive flows. The programming required for start-up is relatively simple compared with the conventional thermal unit. When the starting impulse is received the plant auxiliaries are placed in operation and motors on the gas turbine shafts start the unit rotating. When sufficient speed is reached, the ignition is turned on and the fuel injection commences. The ignition is then turned off and the turbines produce

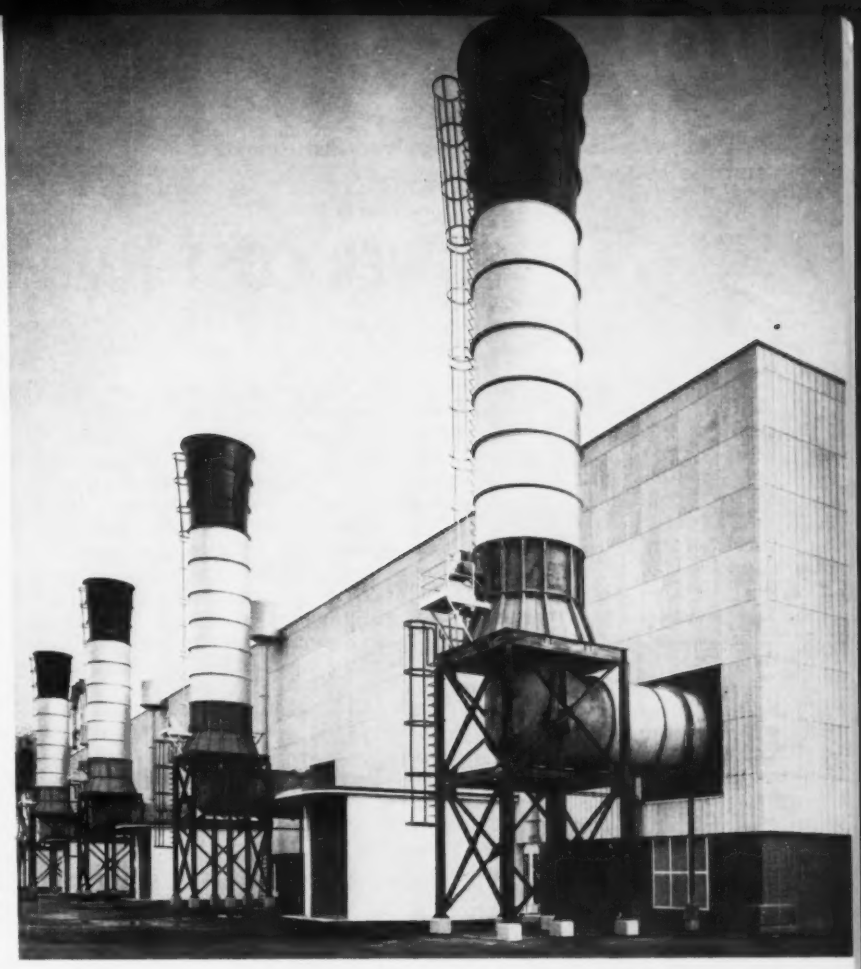


Fig. 3—Port Mann generating station on the B. C. Electric system has four 25-mw gas turbines that can be brought on the line and remotely operated from the Vancouver control center

sufficient power to assist the starting motors to accelerate the set. Before synchronous speed is reached the starting motors are shut down and automatic synchronizing is performed in the usual manner. When the unit is on the line the governor maintains the desired loading on the unit by varying the quantity of fuel admitted to the combustion chamber. A scanning telemetering system operating over a single communication channel is used to provide at the control center a continuous indication of 19 electrical quantities.

Experience with centrally operated generating stations on the utility systems of the Calgary Power Ltd. and the B. C. Electric Co. Ltd. over a 12-year period has been most satisfactory. Cost savings have been achieved along with the many operating advantages of centralized control. As labor costs increase, this method of operation should attract increasing attention from those responsible for the management of electrical systems.

TABLE II—COSTS OF REMOTE AND SUPERVISORY CONTROLS

CALGARY POWER LTD. HYDRO SYSTEM

Plant	Year Built	Year Remoted	Total Capacity MW	Number Units	Cost of Automatic	Cost of Supervisory[4]	Cost of Channel	Total
Barrier	1947	1947	13	1	$14,000	$19,100	$ 7,700	$ 40,800
Cascade	1942	1951	18	1	25,700	24,000	8,800[1]	58,500
Spray	1951	1951	50	1	16,700	23,800	5,200[1]	45,700
Rundle	1951	1951	17	1	15,600	27,100	5,200[1]	47,900
Three Sisters	1951	1951	3	1	12,800	24,100	5,200[1]	42,100
Ghost	1929	1955	51	4	94,000	56,400	6,000[1]	156,400
Horseshoe	1911	1956	14	4	90,300	48,300	26,100	164,700
Pocaterra	1955	1956	15	1	18,600	49,600	47,200	130,000
Interlakes	1955	1956	5	1	14,600			
Bearspaw[2]	1954	1954	17	1	18,200	10,100		28,300
Kananaskis[2]	1913	1951	10	2	13,200	10,900		24,100
	1951		9	1				
Control Center	Control room structure				$34,800			
	Continuous power supply				13,900			
	Electric map				8,100			
	Totalizing metering				3,500			
	Load controller				19,700			
								80,000
								$818,500

1. Capitalized costs of carrier channel rented from Canadian Pacific Railway Telegraphs.
2. Remotely controlled from trouble headquarters in same building.
3. Control center in same building—old units not fully automatic.
4. Includes supervisory equipment for both ends and continuous power supply for remote station.

AEC takes a look at nuclear power costs—and the cost of reducing them. Here is its . . .

POWER COST TIME TABLE

Dr. Frank Pittman, director of the AEC's division of reactor development, recently made public the contents of two significant reports. The first "Summary of Current Status of Reactor Concepts," which gives a comparative look at the cost of power from eight different reactor concepts, and a yet unpublished report entitled "Economic Potential and Development Program" which treats potential costs, the probable date for achieving these costs, and the R & D expenditures required to reduce the cost. Recognizing that a projection of this type must, necessarily, hinge on opinions and judgments, Pittman emphasized that they had projected developmental programs "only to the extent that it is reasonable on the basis of our present knowledge to foresee success." Thus, while the projection postulates complete success, they have refrained from projections based on unproved concepts or major modifications of concepts now known—the success of which may well compensate for unforeseen failures.

Assumptions

Since the assumptions used in developing nuclear costs are as important as the costs themselves, Pittman made clear:

1. The costs are based on 300 emw plants, operating at an 80% plant factor.

2. No credit is taken for such things as shorter construction time, lower engineering costs and lower component costs which will undoubtedly come about as the nuclear industry reaches its maturity.

3. All economics are based on a one-reactor, one-turbine station, no credit was taken for multiple-unit stations such as now are being built in England and Russia.

4. It was assumed that operating, maintenance and insurance costs would remain high for nuclear plants.

5. No increase in reactor capacity beyond design power was assumed, although experience has shown that reactors can generally develop much more than design power after they have operated for a reasonable time.

6. No decrease in the cost of U-235 was assumed.

Recognizing the uncertainty inherent in the cost, Pittman made the following conclusions:

"1. No reactor system can be constructed on the basis of *today's* technology which can compete with power from conventional systems using fuel costing less than 54¢ per million Btu. In this and the following comparison, by the way, I am assuming a conventional plant of 300 mw capacity and a load factor of 70%.

"2. Six of the reactor systems can become competitive with conventional plants using fuel costing in the range of 35-40¢ per million Btu.

"3. Of the six systems, which could compete in areas having conventional fuel costs in the range of 35-40¢ per million Btu, the pressurized water system could do so at the earliest date.

"4. The potential of the water sys-

Here Are Today's Nuclear Power Costs . . .

	Capital Cost	Fuel Cost	O & M Insurance	Total Cost mill/kwh
1. Pressurized water	5.05	3.38	0.85	**9.28**
2. Boiling water	5.26	3.47	0.88	**9.61**
3. Boiling water with integral superheat				
4. Organic cooled and moderate	4.39	5.72	1.34	**11.45**
5. Sodium graphite	6.11	4.12	0.99	**11.22**
6. Gas cooled enriched uranium	5.97	3.21	1.18	**10.36***
7. Heavy water moderate natural uranium	7.05	4.22	1.23	**12.50**
8. Fast reactor	5.10	7.10	1.05	**13.25**
9. Thermal breeder—aqueous homegeneous				

*The total would be 11.89 mills for a natural uranium system.

tems, with nuclear superheat, and the organic system is essentially equal from the standpoint of power cost, time when the potential can be achieved, and development costs needed to reach the goal. Other systems will require one to four years longer to reach their potentials and will require two to three times as much development effort."

Pittman recognized the pressurized water system as the "most technologically advanced" and therefore capable of yielding the lowest cost in mills per kwh.

The boiling water system was only slightly less technologically advanced because much of the pressurized water technology was usable and because of the experience at Dresden, Humboldt Bay and other places.

Referring to the heavy water system, Pittman recognized that his evaluation of the system was materially different than that set forth by the Canadians. He indicated that Canadian figures are based on Canadian economic conditions and that the Canadians were much more at home with the system. Ultimately, the differences were a matter of judgment to be reconciled in time.

Probably the most far reaching effect of the figures in Pittman's report will be the recognition in and out of the AEC of the enormity of the task of bringing about economic nuclear power.

AEC Chairman John McCone recently made public the fact that both Pacific Gas and Electric Co. and Southern California Edison Co. have under serious consideration commercial size nuclear stations aggregating from 600 to 650 mw. McCone's announcement indicated that both companies had received proposals from General Electric and Westinghouse. The statement was made in testimony before the Joint Congressional Committee on Atomic Energy and was used to illustrate the point that atomic stations will become competitive in areas where fossil fuels are expensive.

A high fuel cost area is one where a kilowatt-hour costs 7 mills or more to produce according to the AEC. McCone made clear that the two utilities were considering the nuclear stations solely on the basis of economics and indicated that no federal money would be used in building the plants, though there might be waivers of fuel charges and, perhaps, R and D assistance. He added that the AEC has not been asked for *any* aid.

McCone emphasized that the stations were in the discussion stage.

Neither utility commented on the McCone announcement, indicating that negotiations were not completed.

Here is what they will be . . . if we do a billion worth of R&D

Capital Cost	Fuel Cost	O & M Insurance	Total Cost mill/kwh	Target Year	R&D Costs $ Million	To be spent by year	Required Prototypes	Prototype Cost $ million
4.40	2.56	0.85	**7.81**	**early '60s**	**20**	1965		
4.31	2.29	0.88	**7.48**	**'64-'65**	**20**	1965	Yes, high density	**25**
3.88	1.99	0.88	**6.75**	**1965**	**4**	1965	Yes	**20**
3.65	2.11	1.34	**7.10**	**1965**	**40**	1965	Yes, 75 emw	**30**
4.92	1.92	0.94	**7.78**	**'65-'66**	**82**	1967	Yes, 75 emw	**50**
4.09	2.80	0.78	**7.67**	**1966**	**100**	1968	Yes, 25 emw now under construction at Oak Ridge	**30**
6.49	1.31	1.23	**9.03**	**'67-'68**	**80 (now including Virginia reactor prototype program)**	1967	Yes	**175**
4.43	1.99	1.05	**7.47**	**'68-'69**	**160 (exclusive of funds for PR-DC plant at Laguna Beach)**	1968	Yes	**55**
6.38	2.12	2.83	**11.33**	**'70-'71**	**75**	1970	3 experimental and prototype plants	**100**
					581			**485**

A city inside the campus of the University of New Mexico is its Student Union Building, eight times larger than its predecessor

Adjoining ballrooms divided by sliding doors have stage in one, projection booth other

Ballroom ceiling and projection booth, left, shows cove lights at sides, fixtures center

N. M. STUDENT

CARL R. ALBACH

CONSULTING ENGINEER, SANTA FE, N. M.

The new pueblo-style Student Union, acclaimed to have "everything," was recently completed at the University of New Mexico. This $2½ million building is the latest addition to the ever-growing University Campus.

The new structure, eight times larger than the previous Union, combines facilities with good architectural lighting and electrical conveniences. It can accommodate meetings, banquets, art exhibits, crafts, hobbies, dancing and games. It has some 20 areas for handling food events and its own 205-seat theater that can be used for lectures, movies and special musical programs.

The entire building is equipped for regular telephone connections in and out of the building through a main telephone room on the ground floor. The room also houses the equipment for the Union's own dial telephone intercommunication system. Radio speakers are located throughout the building for handling recorded and local station music as well as announcements with local volume control in all areas. Outlets are also available for connection to and from the future closed TV facilities. In fact, the TV studio is now being built on a lower floor of the building.

Coves, skirted center fixtures and downlight units in cafe ceiling

Fully equipped 205-seat theater and its lighting facilities

UNION "HAS EVERYTHING"

The ground floor contains the theater, self-service bookstore, four-chair barber shop, hobby and craft shop, equipment rooms, maintenance offices and game areas. The latter contains a 14-lane bowling alley and tables for tennis, billiards, bridge, chess and checkers.

The theater has a projection room and a stage complete with stage lights on dimming equipment. The seating area is lighted by two complete coves, recessed "star" fixtures and downlights, all controlled from the projection room through remote dimmers. The stage lights, including colored border lights, floods and spots, are wired to a circuit breaker plug-in-type panel on the stage. In addition, two pockets with pin plug receptacles for ceiling spots were recessed into the main ceiling in front of the coves. Two portable-type dimmer panels, each containing six 1,000-w dimmer circuits with each circuit terminating in six pin plug receptacles, were provided. The stage lights can be plugged into these dimmers on the stage or plugged into other circuits that terminate in a plug-in panel in the projection room and in turn plugged into the portable dimmers at that location.

Bowling alley lighting is controlled from the game desk through contactors and circuited to provide 30 f-c for regular games and 50 f-c for tournaments. The billiard area and the table tennis room are lighted by 2x4 recessed troffers with downlights for highlighting the tables. The troffers are controlled through wall switches and the downlights are remotely controlled from the game desk through low-voltage relays.

Bookstore, barber shop and craft areas are lighted through 2x4 three- and four-lamp troffers with dropped plastic diffusers. The hobby crafts areas provide facilities for ceramics and copper enameling with five kilns to be available. The photography section contains three dark rooms, an enlarging room and a photo exhibit room. The latter contains special recessed fluorescent directional fixtures for lighting the displays.

The main lobby, cafeteria and snack bar eating areas, located on the first floor, are lighted by downlights, rapid start fluorescent cove lights with dimming ballasts and semirecessed incandescent fixtures fitted with specially designed stainless steel "skirts." These fixtures are wired through remote dimmers that can be controlled from the snack bar or the main lobby information desk. The dimming is so circuited that each type of lighting can be controlled separately. The information desk and snack bar are lighted by 4-ft rapid start fluorescent strips located above dropped plastic ceiling panels.

A browsing library and magazine area, located off the main lobby, is lighted by means of recessed fluorescent troffers, downlights and recessed star fixtures. A number of smaller music listening rooms, equipped for high fidelity and stereophonic record players, are located close by.

The student organizations have some 30 meeting rooms available throughout the building. One large area on the second floor for certain semipermanent student offices contains underfloor ducts for power, telephone and intercommunication circuits. A master calendar, containing 4x6 event cards for each day of the year, is located in one corner of this large room and is lighted similar to the information desk.

Food events can be handled in some 20 areas throughout the building. The snack bar, which provides such items as sandwiches, ice cream, coffee and soft drinks, is close to the Corral, a fast-service cafeteria. A number of small waiter-waitress-type dining rooms are located off the cafeteria eating area and a larger dining-meeting room, equipped with dimmer controlled fluorescent cove fixtures, downlights and star fixtures, is also located on the first floor.

Some of the cooking is done by electricity. The building was designed to accommodate a complete electric kitchen at a future date. The bus duct from the transformer vault to the switchboard and the switchboard were designed to handle such a future load while empty conduits and panelboard cabinets were also provided in the kitchen area.

The main ballroom is really three rooms in one. Ballroom No. 1 with the stage at the front and ballroom No. 2 with the projection room at the back are both two stories high. The third room is only one floor high, having 10 hotel-type rooms

Self-service bookstore with typical general lighting employing 2x4 troffers in pairs

Bowling alley provides two lighting levels controlled from the game desk as required

Author's daughter Karen before master calendar lighted by luminous ceiling above

above for accommodating visitors, and is equipped with sliding doors so it can be subdivided into five smaller areas. Ballrooms 1 and 2 can also be divided into two rooms by a set of motor-operated sliding doors the complete height of the room. The ballroom contains dressing rooms, coat room, fireplace, two small balconies, servery for banquets and two adjoining lounges.

The lighting fixtures in ballrooms 1 and 2 consist of rapid start fluorescent cove lights with dimming ballasts, recessed downlights and semi-recessed incandescent fixtures fitted with stainless steel skirts. These skirts are of a different design from the ones in the main lobby and cafeteria eating areas. All these ceiling fixtures are connected through remote dimmers located above the stage and can be controlled from the stage or from the projection room. Ballroom No. 3 ceiling coves, recessed fluorescent troffers and downlights are controlled through a separate remote dimmer as well as from the projection room. The lounges, located between the main lobby and the ballroom and suitable for art exhibits, are lighted by downlights, square coves and recessed semi-indirect star-type fixtures. These are not dimmer operated.

The ceilings in both ballrooms 1 and 2 contain duplex convenience receptacles for seasonal decorative lighting. A number of large range-type receptacles were also recessed into the ceiling for any future display or conference exhibits as may be required to avoid stringing cords all over the floor. Two three-gang ceiling pockets with pin receptacles were also installed near the stage with recessed inserts close by for hanging spotlights.

The ballroom stage is fitted with disappearing colored footlights, colored border lights, teaser spots and floodlights. Flush floor pockets were also installed. All these were wired to a circuit breaker plug-in panel on the stage. Here these lighting circuits can be plugged into the four portable dimmers provided for stage operation or into connecting circuits to the back for portable dimmer control from the projection room. If need be the dimmers can be augmented with the two from the theater since all six are of the same type.

The building was designed by architects Meem, Holien, Buckley & Associates and the electrical work installed by Fischbach & Moore. The lighting and electrical layout was designed by Gilbert Lopez and James E. Armstrong under the writer's supervision.

Motors and Controls—X

How the Codes Apply to Them

TOM HUGHES, ELECTRICAL SAFETY ENGINEER, CALIFORNIA DIVISION OF INDUSTRIAL SAFETY

It is not our intention for this series of articles to dwell on code applications but we will stress the objectives of the codes where they enter in to the proper application of motors and their controls.

There has been some confusion in interpreting or understanding the intent of codes with regard to the use of fuses as motor running-overcurrent protection and coincident use of the motor branch circuit disconnect device as a motor starter, in California. It is not the intent of the California Electrical Safety Orders (with the exception of special cases mentioned in 2398 [b]) to permit the use of a normal disconnect switch as a motor starter (controller); regardless of the type of fuses with which it may be equipped.

By using time-delay fuses of the proper current rating it can be used as both the branch circuit protection and the motor running protection, if an approved-type controller (manual or automatic) is used in addition, for starting and stopping the motor. But, again we want to point out that frequent starting loads, such as air compressors and water pressure systems, should be served by special types of motors designed for such service. Otherwise, any running protective device with a thermal "memory" is going to heat to the tripping point and disgusted users may eventually bridge it with wire.

National Code Differs

But we are told that in other parts of the country (under NECode rules) it has been the practice to permit the application of a smaller size branch circuit disconnect switch, if time-delay fuses were used, and to permit such a combination to be used as the motor controller (if it is a motor-rated switch). Using time-delay fuses (with their higher continuous current rating) will require fuse adapters or the use of smaller switches as size brackets are crossed. This brought about 2-hp ratings for motor-rated switches; the higher rating being contingent with the use of time-delay fuses.

However, while there was no such intent in the minds of the authorities who originated this practice, the matter of the horsepower rating (applied for a motor-rated switch) has become firmly associated (in the minds of electrical people) with the type of fuse to be used. This is so in spite of the fact that these switches are tested and certified by the Underwriters' Laboratories for a certain horsepower under locked-rotor conditions, **with the fuse holders bypassed.**

In other words, the type of fuse used or the presence or absence of any fuse has nothing to do with the ability of that switch to rupture a motor's locked-rotor current safely. For that reason, the California ESO does not recognize the higher horsepower rating as a conditional proposition. When that switch blows up in a man's face he is going to be just as burnt, regardless of what the fuse situation is. And a considerable proportion of the switch explosions are happening with approved-type motor-rated switches mated to the proper-size motor.

Now, as to the correct-size fuse to be used for branch circuit (short circuit) protection. The motor installation tables of the various code tables give the maximum size fuse to be used for different motors, depending on the name plate code letter; the means of starting; the type of operation; etc. But this does not say that the fuse may not be smaller in current rating than that in the table.

As we tried to show in the earlier parts of this article, there may be a thousand different types or styles of motors and ten times as many types of load or modes of operation. So, it is well for the user to keep his fuses as small as will consistently accommodate the starting current of the load. There are two warnings we must give, however. In 480-v circuits it is not a good idea to reduce the fuse size (in the regular single-element type) where it would fall into a shorter case length bracket (with the use of fuse clip adapters). This may jeopardize the fuse's ability to safely rupture a fault current associated with this particular motor setup.

The second warning concerns the reduction of fuse size where used with an automatically controlled motor (unattended). A single fuse blow on such a three-phase motor could cause its burn out by continued running or trying to start under single-phase conditions. So keep a safe margin over the starting current peaks. This may be accomplished by using a chart recorder or an indicating-registering ammeter over an initial tryout period, to ascertain the current demand fluctuations with voltage change during various periods of the day.

Supply to the Control Circuit

There have always been differing opinions among authorities as to the desirability of separate fusing for the control circuit conductors (where, as an example, the branch circuit fuses are 100 amp on a 480-v motor). Thirty years of experience have shown that there is normally little need for such protection when the entire control circuit is enclosed in a metal raceway system.

In recent years, however, more and more remote control push button stations are being used on the end of lengths of multiwire portable cable and this alters the circumstances. Naturally, a cable on the floor is always subject to severe injury and complete shorting of the conductors. It has been the author's experience that the small stranded shunts and springs of the overcurrent relays are more vulnerable than the conductors of the control system. On 480-v service we have seen such shorts in extended control circuits destroy the overload relay without blowing any branch fuses.

Thus, we believe that low amper-

age fuses (three to six amp) should be inserted in the control circuit if any portion of it passes through portable cord or cable subject to normal mechanical injury. This would require a fuse in each of the two supply conductors or taps from the line side of the starter.

Some designers of industrial setups prefer to use reduced voltage for control circuits. Where the motors run on 480-v supply voltage they use a transformer to reduce the control circuit voltage to 120 v. In some cases it may be reduced as low as 24 v, where special auxiliary devices can best be designed for such a voltage.

Now, whereas the control circuit for one motor is normally tapped off the line terminals of the starter (controller), this different source of energy (at reduced voltage) places a foreign circuit in the enclosure of the controller. Under the normal setup for a small motor and its controller, everything in the controller case is dead when the branch circuit disconnect is opened. But not so with this foreign circuit. This presents a hazard to a worker, who opens the controller case to adjust or repair and encounters unexpected live terminals.

The same set of circumstances exists where the motor supply voltage is utilized for control circuits but there is interconnection between the controls for a group of motors to provide sequence starting or interrelated performance. Thus, again, foreign sources of energy exist in each controller enclosure and live terminals may be found after the branch circuit disconnect for that controller has been opened.

Aside from this hazard of unexpected live terminals in the controller, there is another hazard from unexpected starting of equipment as a branch disconnect is closed. With a magnetic holding coil in the controller for a certain motor fed from an outside source, the controller may have its contacts closed by a distant actuating device. The driven machinery is being repaired while the branch circuit switch is opened and when it is closed the equipment immediately starts because its controller is already closed. These circumstances could cause the switch to arc as it is closed on locked-rotor current or injury to personnel or damage to equipment from unexpected starting.

(In the following article, next month, the three choices allowed by California's Safety Orders will be related by the author.)

To clear a contested question relative to fluorescent fixture . . .

FUSING OF BALLASTS

Ballast explosions and fires in fluorescent fixtures have long been the subject of complaint by electrical contractors and inspectors. As a means to prevent such fires from occurring some manufacturers have designed fixtures incorporating a fuse so that it will open the circuit should the ballast begin to fail.

A problem arose in California over the installation of such fixtures because the California Electrical Safety Orders of the Division of Industrial Safety required that any fuse holders be mounted in such a manner as to be accessible from the outside. This posed construction and cost problems and the manufacturers appeared before Thomas Saunders, chief of the division, to ask for relief.

Ballasts were tested and demonstrations of ballast failures were given. As a result of this meeting the following interpretation was issued to the technical staff of the division by Chief Saunders.

Saunders' Letter

In order to guard against damage or injury which might result from failure of the ballast in fluorescent lighting fixtures, certain manufacturers have fused the fixture's circuit in such a way that the fuse is intended to fail when the ballast fails.

The purpose of this fuse is to prevent short circuiting of the ballast from progressing to the point where excessive heat is developed with the possible accompaniment of explosive gases. In other words, the fuse is intended to cause the device to fail safely, thereby making the fused fluorescent fixture a safer fixture than one which is not fused.

At the time this addition was made to the circuitry, the division required a means of disconnecting *this fused branch circuit*. A disconnecting-type fuse holder was accepted as meeting this requirement. It was further required that the fuse holder be mounted in the fixture so that the means of disconnecting was accessible from the outside of the fixture [Electrical Safety Orders 2412 (d), (g), and 2367 (a) (2)].

The manufacturers of the light assemblies, as well as manufacturers of the components, have maintained that it is desirable, from an over-all safety standpoint, to locate the fuse and switch assembly *within* the fixture housing where it is *not* readily accessible to inexperienced or unqualified personnel. They state that there is an almost one-to-one correlation between fuse and ballast failure, and that failure of the fuse means that the ballast must be replaced.

The division accepts this argument as a valid reason for not installing the disconnecting device where it is accessible from the outside of the fixture and is of the opinion that no unreasonable or unusual hazards are imposed when the electrician must remove the cover panel to refuse or when disconnecting the individual branch circuit when replacing a ballast or making other repairs within the fixture.

It is pointed out, in reference to this last point, that the fuse is *not required* by our Safety Orders, and that in the case where no fuse is installed we do not require that provision be made for disconnecting each individual fixture. In all cases, (i.e., where there is no fuse or where a fuse has been installed in the fixture at the will of the manufacturer) disconnecting means is provided in the branch circuit which *includes* the individual fixture.

This interpretation is based upon an attempt to maintain a single standard with regard to fluorescent fixtures and it is essentially a performance standard. There is no record that the absence of a disconnect on the individual fixture has been the proximate cause of injury and therefore a disconnect is not required. Where a fuse is installed within the fixture it does not appear that the chance of injury is increased by the *absence* of a disconnect. Therefore, no disconnect readily accessible from the outside will be required.

In order to minimize the hazard which may be present when replacing fuses within the fixture, disconnecting-type fuse holders will continue to be required.

ELECTRICAL WEST
Construction News

For
- contractors
- consulting engineers
- lighting engineers
- wiring designers
- distributor salesmen
- all interested

Outside bureau

An Electrical Industry Service Bureau has been set up by the electrical contracting industry in the greater Denver area, independent of the Rocky Mountain Chapter, NECA, although John Hecht, chapter manager, is assisting in the preliminary operation. The bureau services will be available to any contractor and is entirely voluntary. It will provide services to improve business practices, supervise operation of a bid depository and provide statistical information. The trust department of the First National Bank of Denver will operate the depository, rules of which bureau members have accepted.

Continue

Northwest Line Constructors Chapter, NECA, Portland, re-elected all officers at its Jan. 15 meeting. They are: Homer E. Puariea, Cable Construction Co., president; Matt O. Wilson, Wilson Construction Co., vice-president; Riley R. Stevens, Stevens Tree Surgery, treasurer; James P. Doyle, Charles T. Parker Construction Co.; and Roy L. Sargent, Power Line Erectors Inc., directors. Re-elected to serve an additional two-year term as chapter governor was George B. Schetky, Western Electrical Construction Co. Marian Carney, the only woman chapter manager in NECA, is also its most attractive.

Moves to council

Ernest Kramm is now the secretary-treasurer and legislative representative for District 9 Council, NECA. This move has been in the making for some time and was finally made firm at the District 9 Council meeting in Los Angeles. Formerly known as the California-Nevada Conference of NECA Chapters, the council is organized now with a permanent secretary-manager. Norman Ferguson, California Electric Works, San Diego, and NECA District 9 vice-president, is president of the council also.

Northern California Chapter, NECA, then elevated assistant chapter manager Matt Gallagher to the managership of the chapter as of Feb. 1. Gallagher has been with the chapter a year and previously managed a Santa Barbara area chapter which has since been merged with the Santa Clara-San Benito Chapter out of San Jose. Gallagher says the chapter will probably require a new assistant manager since it covers Alameda, Contra Costa and Solano-Napa branches of NECA. Kramm will headquarter temporarily at the Northern California Chapter but will soon establish an office of his own, possibly in Hayward. He has been the NECA chapter's official representative on the Construction Industry Legislative Council under arrangements with the chapter.

Head 1960 programs

E. C. Armstrong, Wazee Electric Co., was elected 1960 president of the Rocky Mountain Chapter, NECA; Ernest C. Graham, Belmont Electric Co., vice-president; Steve Strong, Scott Bros. Electric, secretary; and Roy Kennedy, Kennedy Electric, treasurer. Harris Steele,

who has been president, was elected governor. He is owner of Reliable Electric Co. Ed Kummer, Kummer Electric Co., was chosen Boulder, Colo., division chairman; Frank Kading, Advance Electric Co., Casper, division chairman; and W. G. Dale, Dale Electric Co., Cheyenne, division chairman. Executive board members, all of Denver, include: Ralph Johnson, Sturgeon Electric Co.; Carl Crummel, Collier Electric Co.; Forrest Quelbog, Commonwealth-Stiles Electric Inc.; Walt Neill, Neill Electric; Dale Strohminger, Strohminger Electric; Charles Band, Acme Electric; and Cliff Weiss, Intermountain Electric.

Returned

San Francisco Electrical Contractors Assn. re-elected all of its officers at its annual meeting Jan. 28. Emil J. Weber was re-elected for his ninth term as president. Fred Wider, Electrical Maintenance & Service Co., is vice-president; Matt Buzzell, Buzzell Electric Works, secretary; L. Roy Moser, treasurer; and the directors are John F. Bauer, Fischbach & Moore; William Langlais, Charles A. Langlais Co., who is also governor; Warren G. Smith; C. D. Lindstrom, Weidenthal-Gosliner Electric; John DeGregorio; James Darrow; and M. Roth, Roth Electricians. Only change is that William J. Varley, who had been manager for more than 20 years, has become executive manager for the Joint Industry Board. Robert Frank is acting manager.

Negotiations

Boise Local 291, IBEW, and Intermountain Chapter, NECA, settled negotiations with a 15¢ an hour increase effective June 1, 1960, bringing the scale to $2.75, without fringes. Negotiations in the Pocatello area, where the union is asking a whopping 70¢ an hour increase, have begun. In the Grand Junction area negotiations are soon to open.

Want "home rule"

Not satisfied to be but a remote branch of the dominant Los Angeles centered Electrical Maintenance Engineers Assn. of Calif., a new independent organization has been started for the entire San Francisco Bay area, to be called Greater Bay Area Electrical Maintenance Engineers Assn. Leaders in the move are former president of the Southern California EMEA, Jack J. Singleton, superintendent, electrical department, Pacific States Steel Corp. at Union City; R. B. Rymer, manager, General Electric Apparatus Service Shop; D. J. Miller, substation maintenance specialist, PG and E; R. L. Saling, Westinghouse; and others. Organization meeting was held Feb. 17.

Protest

A city ordinance in Tucson waiving city inspection in newly annexed areas and accepting VA-FHA inspection in lieu of that of the city of Tucson is being fought in the courts by the Electrical Joint Industry Board of Arizona. The board says it will carry it to the Supreme Court if necessary.

Wiring the "Home of the Future," built by students of the Los Angeles Trade-Technical College, is being done by the apprentice electrical wiring class and will incorporate all of the latest methods and devices for home wiring. The wiring class is taught by Guy Muff.

Westinghouse integrated turbine components promise economical superload growth

America's electric utilities face a challenge unparalleled in history —load growth which will require a total generating capacity of more than 600 million kw in just 20 years! In the face of such tremendous demand increases, building more and larger turbine-generators at reasonable cost presents physical and economic problems never before encountered.

Through the principle of Integrated Components, Westinghouse has conquered the four primary barriers to designing and building these complex, high-capacity machines—namely, design flexibility for a wide range of machines, high reliability characteristics, fast delivery, and controlled costs.

On the following pages, Westinghouse reports on progress and development which, even now, promise a working solution to meeting future power needs economically and reliably.

YOU CAN BE SURE...IF IT'S Westinghouse

Westinghouse integrated components combine to meet your needs faster, more economically

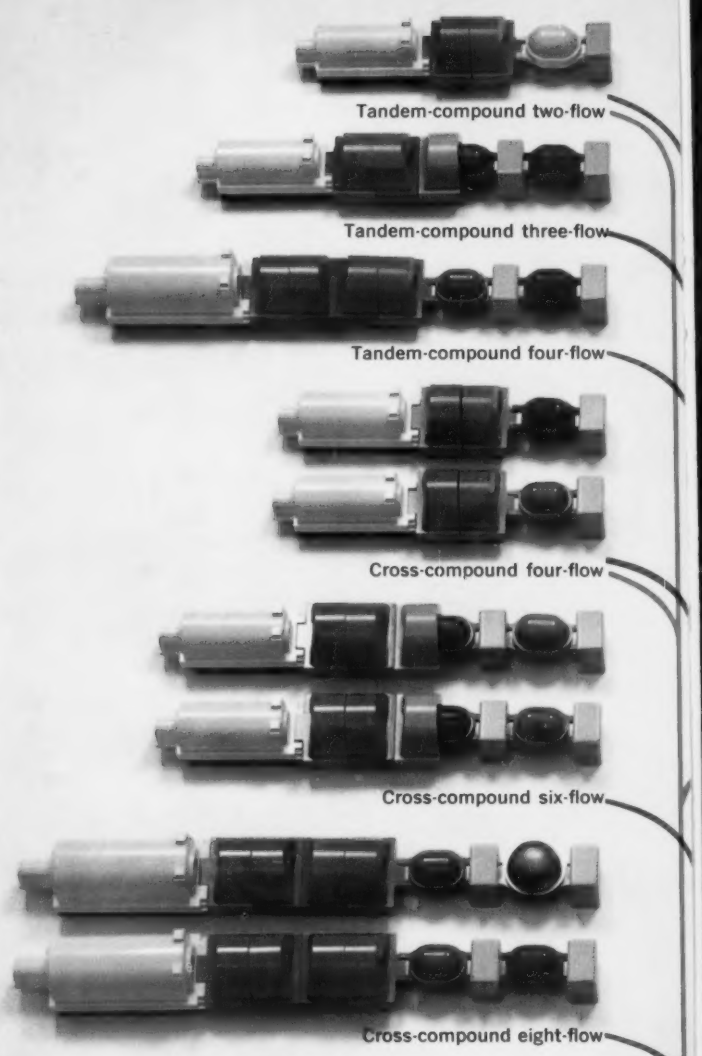
1800-RPM ELEMENTS

1. Generator
2. Low pressure
3. Large low pressure
4. Intermediate pressure

3600-RPM ELEMENTS

5. Low pressure
6. Intermediate-low pressure
7. Intermediate pressure
8. High-intermediate pressure
9. High pressure
10. Very high pressure
11. Super-pressure

3600-RPM



These pre-engineered turbine building blocks are the logical solution to achieving massive power additions without prohibitive time, man power and cost problems.

After careful study of the types of machines needed in the future, Westinghouse designers found that any type could be built from a combination of the 10 basic elements shown at the left.

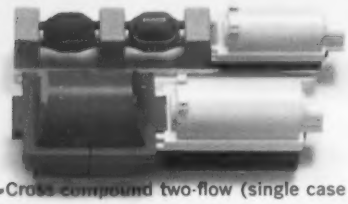
The elements can be arranged in single, double and triple shaft units.

The 3600-rpm elements can be combined for tandem- or cross-compound, two-, three- and four-, six- and eight-flow machines.

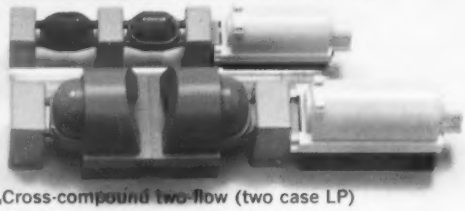
A complete line of 1800-rpm units also can be built using the basic elements.

Increased ratings can be produced by adding higher pressure and temperature elements to a combination of the 10 basic elements that make up the three machine arrangements. Eventually, cross-compound machines may operate under steam conditions as high as 6000 psi at 1200° F, with ratings up to 1500 mw!

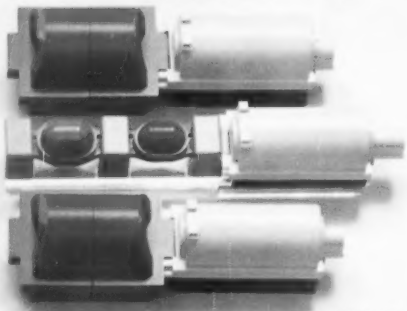
3600/1800-RPM



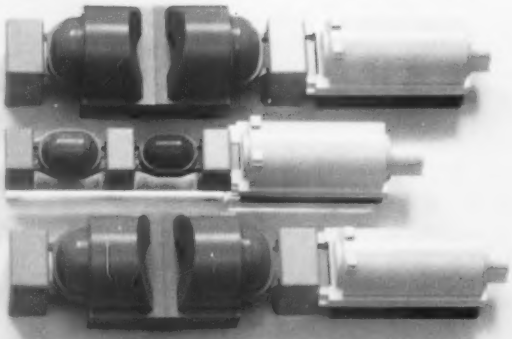
Cross compound two-flow (single case LP)



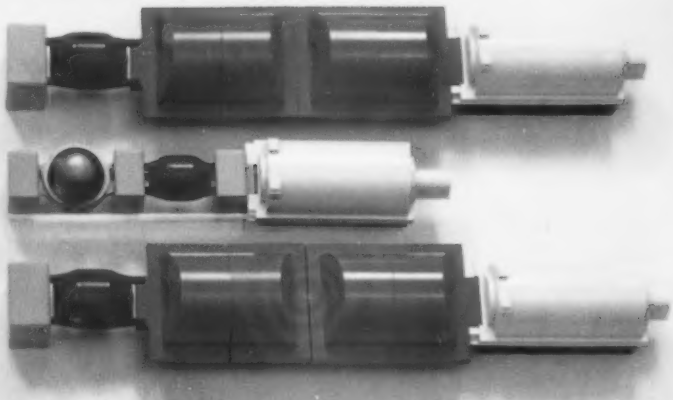
Cross-compound two-flow (two case LP)



Triple shaft cross-compound four-flow (single case LP)



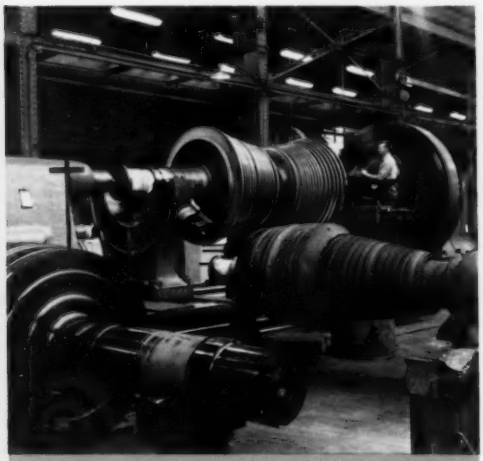
Triple shaft cross-compound four-flow (two case LP)



Triple shaft cross-compound eight-flow

Westinghouse integrated components in use today prove their value

The Integrated Components in use today are not merely adaptations of existing elements. They are new designs based on the latest concepts. All of these design and engineering advances mean time, man power and money saved. Highly qualified personnel are freed for further research and development to help you meet expanding future power needs economically.



Spindles, shown here in three stages of development and finishing, can be ordered for back-up and machined to fit your exact requirements.

YOU CAN BE SURE..

As a result of Integrated Component Design practice, Westinghouse can order, for example, 10 duplicate sets of major castings at one time—including inner and outer cylinders, nozzle chambers, and glands—as well as a composite spindle forging for back-up. This means faster deliveries and a high degree of material and manufacturing reliability.

INTEGRATION GOES BEYOND BASIC ELEMENTS

Associated components, such as throttle valves, steam chests, interceptor valves, oil reservoirs, pedestals and control systems, can be pre-engineered as precisely and successfully as the basic turbine elements.

For example, a thorough study of throttle valve and steam chest sizes for reheat turbines ranging up to 325 mw showed that only four sizes are needed.

Pictured on this page are only a few of the many associated components and turbine elements which, like the pedestal below, have been engineered and built on the Integrated Design principle and are already proving that this practice is a sound one.

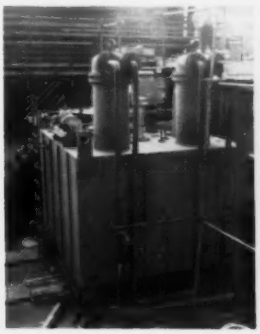
This model of a turbine-generator shows advanced-design components in a practical application. With a capacity of 325 mw, this 3600-rpm, tandem-compound four-flow unit uses an opposed-flow high pressure element, a double-flow intermediate pressure element, and two double-flow low pressure elements. (See models on opposite page.) These same elements can be used to build a cross-compound four-flow unit.

This integrated high pressure element has been designed for a range of steam conditions from 1800 psi at 1000° F, to 2400 psi at 1050° F, for use in turbines rated from 175 mw through 325 mw. It can be used in tandem-compound three-flow, tandem- and cross-compound four-flow 3600-rpm, and cross-compound two-flow 3600/1800-rpm arrangements.

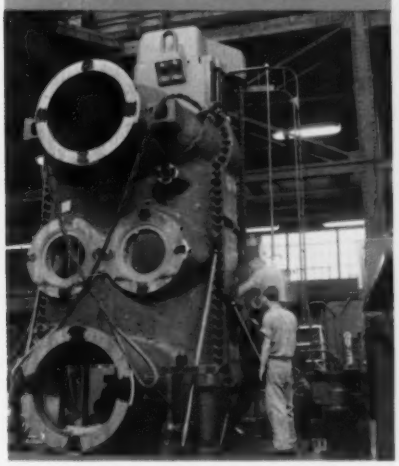
ADDITIONAL BENEFITS

Another important area of this program is the advance planning of equipment drawings needed for customer plant layout work. These drawings include oil piping, turbine outlines and unit wiring diagrams. Preplanning puts this material in the purchaser's hands earlier and allows for faster over-all plant layout than ever before possible.

Integrated Component practice permits improved manufacturing techniques, design flexibility, faster deliveries and controlled costs to help you meet your future power needs economically.



Preplanned components include the oil reservoir shown here. Three sizes were chosen for turbines ranging from 50 to 400 mw. The height and width are held constant, while capacity changes are made by varying the length, thus permitting duplications in the details—plate size, oil-pump supports, oil piping, oil-cooler supports and general hardware.

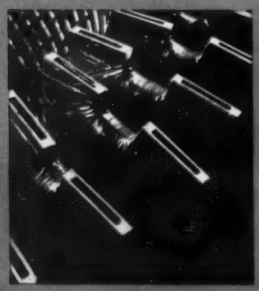


This low pressure cylinder for a 325-mw unit is typical of Integrated Component Design in practical application today.

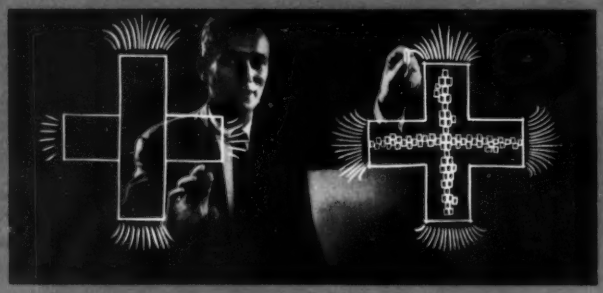
In pre-engineering low pressure turbines, designers have standardized most components. For example, low pressure cylinder covers, like the ones at the left, are exact duplicates except for the single-flow ends used in three- and six-flow machines.

URE... IF IT'S Westinghouse

generator research program leads to higher capacities, lower maintenance



Two Westinghouse developments have made it possible to build—now—generators to match the higher ratings resulting from Integrated Component Design in turbines. Thermalastic® insulation and Inner-Cooling are standard features on Westinghouse generators today, and have opened the door to greater advances for the future.



Additional advances are expected from projects now underway.

The search for an electrical sheet steel with better magnetic properties in all directions has resulted in Cubex,* which will permit higher quality sheet with lower losses.

Even Thermalastic insulation is being improved. New high-temperature resins, coupled with mica tapes using noncellulosic structural materials, have resulted in an insulation system with even greater thermal endurance.

The work on better steels, excitation systems and a host of other developments is constantly proceeding. The results will play a vital part in helping you meet future power needs economically.

*Trade-Mark

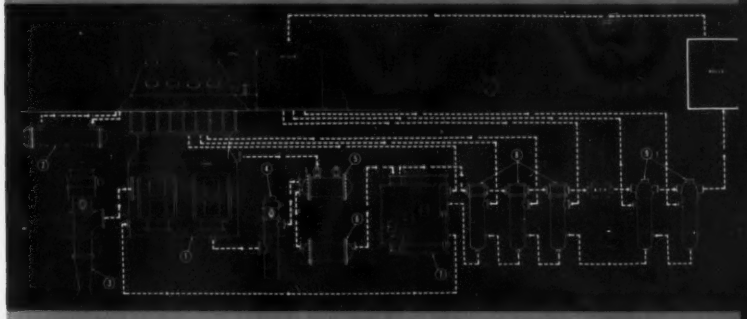
YOU CAN BE SURE...IF IT'S Westinghouse

full line of heat transfer apparatus permits best design for higher efficiencies at lowest cost

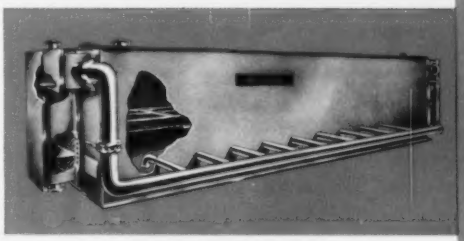
COORDINATED DESIGN IMPROVES POWER GENERATION EFFICIENCIES

The most complete power generation product line in the industry guarantees you the added efficiency of components specifically designed to work together. The wide range of heat transfer apparatus elements shown below embodies design refinements which allow the flexibility necessary to produce these efficiencies at the lowest possible cost.

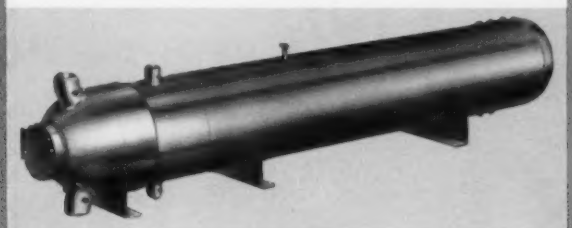
COMPLETE LINE OF WESTINGHOUSE HEAT TRANSFER APPARATUS IMPROVES STEAM CYCLE EFFICIENCIES, PERMITS FLEXIBILITY IN PLANT LAYOUTS



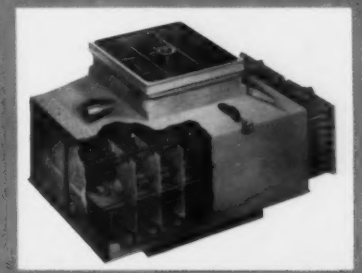
1. Condenser
2. Oil Cooler
3. Circulating Pump
4. Condensate Pump
5. Air Ejector
6. Gland Steam Condenser
7. Flash Evaporator
8. L. P. Heater
9. H. P. Heater



Flash Evaporator: The flash evaporator provides a low-cost means of making ultrahigh purity water for boiler feed make-up from either fresh water or sea water. The submerged tube type is also available.



Feedwater Heaters: Shown here is the new hemispherical, welded head, high pressure feedwater heater, especially adapted to the increased temperature and pressure of the large turbine steam cycle. The new head and welding design philosophy stems from nuclear steam generators where system integrity is critical.



Westinghouse Radial Flow Rectangular Condensers: Readily adaptable to any turbine exhaust configuration, exclusive Radial Flow design permits exhaust steam to completely envelope the tube bundles from any point of inlet.

Pumps: Horizontal centrifugal, vertical mixed flow, and propeller pumps are available in either single- or multi-stage design to cover any range of capacity and head requirements.

Air Ejectors: First developed by Westinghouse, a complete line of priming and operating air ejectors affords safe and reliable removal of air and noncondensables by simplified piping and the elimination of relief valves and segregating valves between stages.

As a result of progress already made, and continuing research and development in turbines, generators, condensers and all related equipment, Westinghouse is ready now to help you plan, design and build complete generating stations to meet future power needs economically.

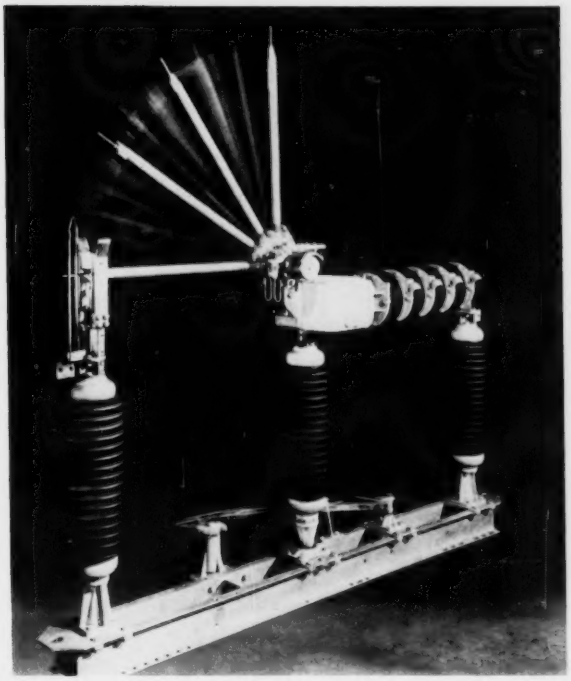
Call or write Westinghouse Electric Corporation, Steam Division, Lester Branch P.O., Philadelphia 13, Pennsylvania.

YOU CAN BE SURE...IF IT'S Westinghouse

Litho in U.S.A. J1-50611

PRODUCT NEWS

New Designs and Applications



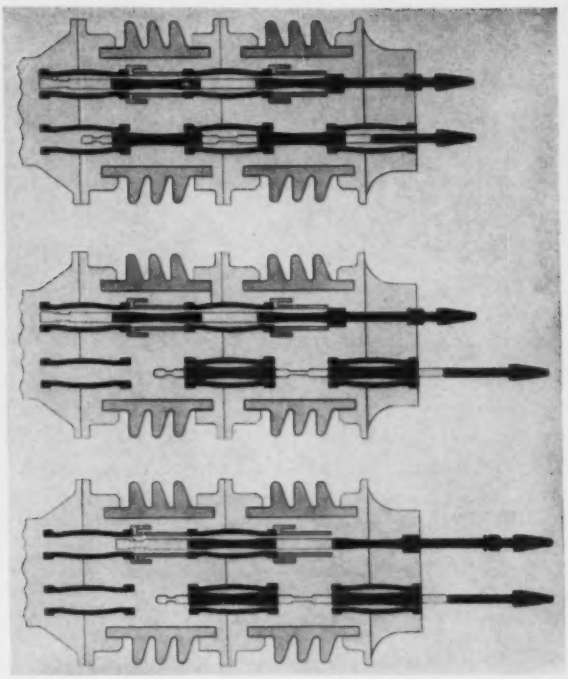


Photo shows Circuit-Switcher with the conventional disconnect mechanism at left and the control mechanism and interrupter section at the right. Schematic diagram is of interrupting unit (isolating means not shown). Top: load and high-speed rods in conducting position; middle, load rod moves to open position; bottom, high-speed rod moves to open position. Both rods are back in conducting position when isolator is fully open. Savings are promised with the new device

Circuit-Switcher Has Wide Range

(1) *S & C Electric Co., 4435 N. Ravenswood Ave., Chicago 40, Ill.*

The S & C Electric Co. has announced a new device—called Circuit-Switcher—which can perform in lieu of circuit breakers for a wide range of applications, making possible marked equipment savings. Recommended switching applications are:

Parallel or loop switching
Transformer switching
Cable switching
Line switching
Capacitor switching

The new devices are rated from 34.5 kv to 138 kv, 600-amp continuous rating. Circuit-Switcher looks like a load interrupter, can be mounted in any position like a load interrupter, is opened and closed like a load interrupter and visibly isolates circuits.

In many important respects, however, the Circuit-Switcher is like a circuit breaker. It carries current continuously through its interrupting unit. The close and trip mechanisms are fully enclosed and protected, it trips from stored energy—stored within the device. It also has trip-free features and latch-check switch and positive sequence control as part of the mechanism. No operating procedure can cause an incorrect sequence between the interrupting unit and the disconnect blade.

The interrupting section of the switch is built in module form so that the switching capability of the device can be tailored to the severity of the application.

Application classifications and corresponding prices are available in S & C price sheet 711. The innovators of Circuit-Switcher point to the fact that with a building block interrupter it will be possible in later models to provide fault interruption capability.

Clamps

(2) *Burndy Corp., Norwalk, Conn.*

Aluminum parallel groove clamps with interlocking fingers have been introduced by Burndy to simplify installing overhead line and service connections. An addition to the company's Tapit line, the new connectors, designated UCG, accommodate copper, aluminum and ACSR from No. 8 through 1/0.

Interlocking fingers on the connector body halves prevent rotation and mismatching, the announcement states. Gripping edges on the hexhead bolt and square surfaces on the connector body facilitate two-wrench installation, while the nonturning square shank simplifies single-wrench installation.

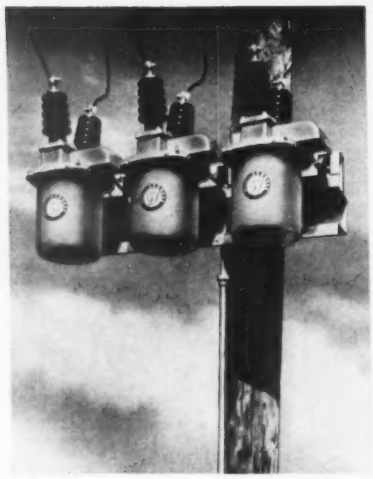
When you select a size and grade of strand for a specific job you want to know that it meets every requirement of that job. You want ample strength to sustain the ultimate load—plus an adequate safety factor. You want pliability for ease of working in the field. You want ruggedness to withstand the abuse which may be encountered during and after installation. You want long, dependable life. And, you want reasonably low first cost and low maintenance costs.

For more than 50 years *Crapo* Galvanized Steel Strand has consistently demonstrated its ability to more than meet all of these requirements. Proof of its reliable performance is to be found in the case histories of overhead power and communication lines throughout the country.

Crapo Galvanized Steel Strand is fully protected against corrosion by heavy, uniform, dense coatings of commercially pure zinc tightly bonded to the individual wires. All grades and sizes are available in A, B and C weights of coating.

For details, ask our distributor or write direct!

INDIANA
STEEL & WIRE
COMPANY, INC.
Muncie, Indiana



Distribution Oil Switch

(3) *Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.*

A new 200-amp, 15-kv oil switch (type CSL) was designed for pole-mounted capacitors, sportsfield and street lighting, and as a load-break isolating switches on rural and suburban distribution systems.

According to the manufacturer, the new oil switch is solenoid-operated and requires only two cycles to open and six to reclose. This fast response insures simultaneous operation of all three switches on a three-phase capacitor bank and prevents neutral shift with resulting high voltage to ground.

During closing, initial contact is made on the tips of contact fingers, which are wiped clean as closing is completed, minimizing resistance. When the switch is fully closed, the current path is through contact surfaces never exposed to a strike. Contact speed is a minimum of 10 fps to help avoid re-ignition and restrike during capacitor switching.

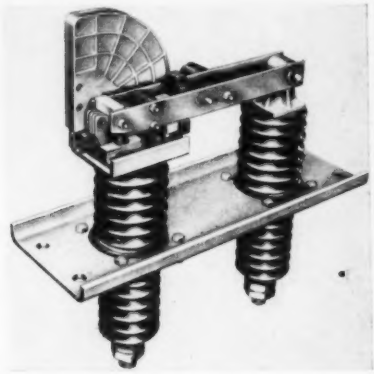
The 200-amp, 15-kv switch has a 95-kv BIL level, a momentary current rating of 9,000 amp, RMS asymmetrical, and a one-second rating of 6,000 amp, RMS symmetrical. Control voltage is 120 or 240.

All-Aluminum Tap Clamp

(4) *A. B. Chance Co., Centralia, Mo.*

This tap clamp of all-aluminum construction accommodates main line and jumper wires up to 397.5 mcm ACSR. It was designed for making aluminum-to-aluminum taps and is said to be particularly advantageous in marine and industrial areas where problems of corrosion are severe.

These new protected connection clamps have extra wide clamp jaws, which make maximum contact with the outside strands of the main line conductor. A special "waved" main line contact shape assures making low resistance contacts on clean or even moderately oxidized conductors, according to the manufacturer.



Interrupter Switch

(5) *I-T-E Circuit Breaker Co., Greensburg Division, Greensburg, Pa.*

A new, modified type HPL-C interrupter switch for high fault closing requirements up to 40,000 amp has been added to this manufacturer's line.

Design features include new spring loaded, heavy-duty, self-aligning silver plated stationary main contact fingers; heavy silver tungsten tipped, hard drawn electrolytic copper blades; heavy, silver tungsten tipped, moving and stationary arcing tips; special blade guide; and extra heavy, formed steel base.

Ratings are listed as 600 amp continuous and 40,000 amp momentary. The manufacturer says test reports are available showing closing operation on 40,000 rms amp asymmetrical, at 14.5 kv. Details are covered in bulletin 1616A.

(6) **Stringing Block for Spaced Aerial Cable**—This stringing block provides an efficient, simple and economical means of installing spaced aerial cable, the manufacturer states. The open design permits easy placement and removal from both the support messenger and the insulated cables, according to the announcement from Line Materials Industries, McGraw-Edison Co., Milwaukee 1, Wis.

This New Book Presents the FACTS about HOLOPHANE Mercury Vapor Lighting for Industrial Plants

◀ *Typical Spread*

NO. 635—LOBAY

NO. 640—HIBAY

8 Case Histories reviewed... in this publication demonstrate the superiority of HOLOPHANE LOBAY® and HIBAY® prismatic glass reflectors with color-corrected mercury vapor lamps . . . Each case-report covers an actual installation in one of the nation's leading plants. It includes analysis of illumination data with references to mounting heights, spacing, lamps, footcandles, etc... Comparisons with other types of lighting systems are tabulated . . . In every instance, the results prove that Holophane mercury vapor lighting systems produce the most efficient, economical and serviceable illumination for today's industrial plants.

HOLOPHANE COMPANY, INC.
Lighting Authorities Since 1898
342 Madison Ave., New York 17, N.Y.

THE HOLOPHANE CO., LTD., 418 KIPLING AVE. SO., TORONTO 18, ONT.

- *This 24 page book just off the press is available to you without charge*
- *Mail the coupon without delay...*

A

Holophane Company, Inc.
342 Madison Ave., New York 17, N. Y.

Please send "FACTS" Book on Holophane mercury vapor lighting for industry; no obligation.

NAME_____

ORGANIZATION_____

ADDRESS_____

CITY_____ ZONE____ STATE____

GENERAL ELECTRIC'S

Boosts by

"PRIVATE-LIGHTING" PACKAGES Especially for "private-lighting" applications, General Electric offers the Acrylic-Suburban luminaire in attractively priced equipment packages:

Cat. No. C648G017—Acrylic - Suburban luminaire complete with cadmium-sulphide photoelectric control, acrylic refractor, hood with 175-watt built-in ballast (lamp not included), 4-foot aluminum bracket.

Cat. No. C648G016—Acrylic - Suburban luminaire complete with cadmium-sulphide photoelectric control, acrylic refractor, hood for up to 6000-lumen filament lamp, mogul base, 7-inch light center (lamp not included), 4-foot aluminum bracket.

BB's and stones bounce off

NEW ACRYLIC-SUBURBAN LUMINAIRE

"private-lighting" profits cutting maintenance costs

Exclusive shatter-resistant plastic refractor tops money-saving features

Here's a luminaire designed and built to keep your maintenance trucks in the garage, and your "private-lighting" accounts on the profit side of the ledger. It's the new General Electric Acrylic-Suburban.

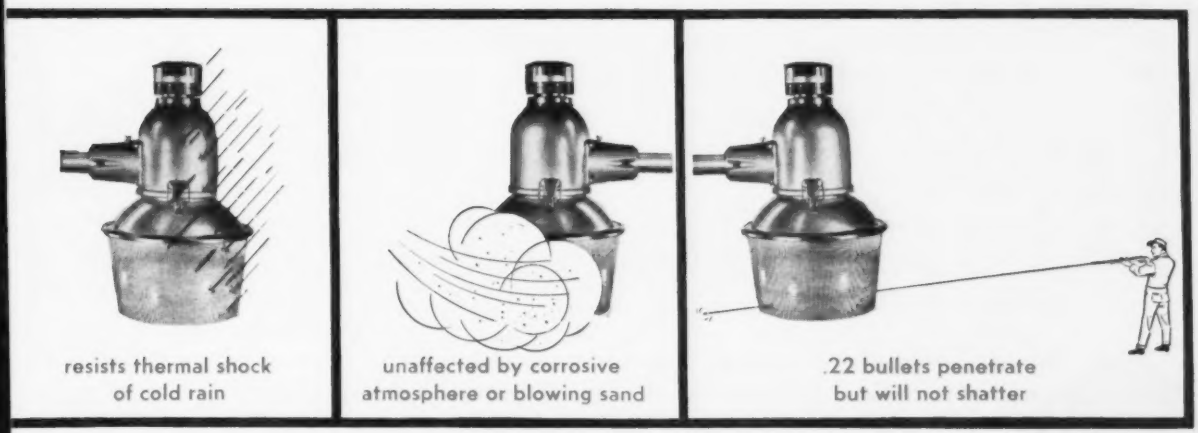
Realizing that repeated service calls can severely hamper any rural and suburban lighting program, General Electric has built into the Acrylic-Suburban these time- and money-saving features:

- The industry's first-and-only open refractor of durable plastic—virtually unbreakable in normal service—developed from General Electric's years of experience with acrylic refractors for mercury luminaires such as the M-250. This precision-molded refractor is more costly to make than glass and offers more resistance to all causes of breakage, yet you pay *no premium* in price. It has the same high transmissivity as glass, and is interchangeable with many standard glass refractors. One-fourth the weight of glass, it's far easier to install.
- General Electric's dependable cadmium-sulphide photoelectric control, which mounts right on the locking-type hood for automatic dusk-to-dawn operation. It's built and tested for years of reliable, trouble-free performance.
- Long-life ballasts built right into the hood for mercury lamps up to 250 watts (hoods without ballast for up to 6000-lumen filament). Since mercury lamps generally last two to three times longer than filament, this means far fewer service calls for relamping.

It all adds up to a luminaire you can install and forget. Whether it's for suburban streets, commercial establishments, or areas around private homes and farms, the General Electric Acrylic-Suburban can mean increased lighting profits for you. For full details and immediate shipment from stock, call your General Electric Apparatus Sales Engineer or Agent. General Electric Company, Outdoor Lighting Dept., Hendersonville, North Carolina. 460-01

Progress Is Our Most Important Product

GENERAL ELECTRIC



resists thermal shock of cold rain

unaffected by corrosive atmosphere or blowing sand

.22 bullets penetrate but will not shatter

For phone number of closest representative see advertising index in back of book.

From regulator to lamp

. . . use cost-saving

SUPERIOR CABLES

Thermoplastic Series Lighting Cables

- High resistance to earth acids and alkalis
- High resistance to sunlight, moisture, weather
- Small diameter, lightweight
- Easy to splice

Figure 8 Pole & Bracket Cable

- High resistance to abrasion, mechanical damage
- Does not deteriorate with age or weather
- Will not support combustion
- Flexible, strips clean, speeds installation

Performance and economy go hand in hand with SUPERIOR plastic insulated and jacketed cables.

All SUPERIOR CABLES are quality-engineered, precision manufactured and thoroughly tested.

From regulator to lamp . . . for low initial cost . . . for less maintenance cost . . . order SUPERIOR CABLES!

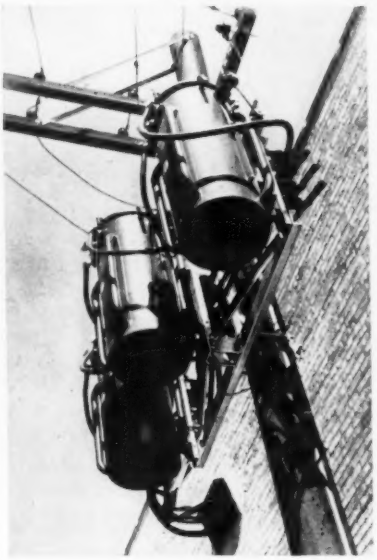
For complete information and prices, write

SUPERIOR CABLES

SUPERIOR CABLE CORPORATION

Hickory, North Carolina

3869



Transformer Mount

(7) *Joslyn Mfg. & Supply Co., 3700 S. Morgan St., Chicago 9, Ill.*

This new transformer mount was developed for "in-line" mounting of three distribution transformers up to 75 kva; is used chiefly on alley installations to provide climbing space between the pole and a building wall. The J25564 mount is hot-dip galvanized.

Assembly of transformers, mount and secondary bus can be made on the ground and then the entire unit hoisted up and banded to the wood pole, the manufacturer states.

Flashing Beacons

(8) *Crouse-Hinds Co., Syracuse 1, N. Y.*

Crouse-Hinds beacons, used with Crouse-Hinds motor flashing switches, are designed for use as warning signals at intersections where traffic conditions are hazardous but traffic counts do not justify installation of traffic signals.

Nonadjustable beacons are designed for use at right-angle intersections; adjustable beacons are for intersections where the angle between the streets is other than 90°. In the adjustable type, each optical unit may be separately adjusted so that it may be aimed directly toward the traffic that it controls.

Beacons are available with arrow lens instead of plain lens if desired; and may be equipped with a base light.

STATEMENT OF POLICY

To all users, purchasers, jobbers and distributors of products manufactured and sold by Preformed Line Products Company, Cleveland, Ohio:

It is and shall continue to be the policy of our Company to sell any and all of our products, patented or unpatented, without limitations, restrictions, conditions or "tie-in" arrangements or understandings of any kind.

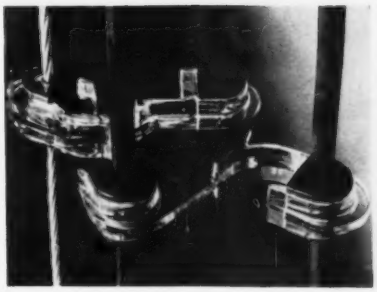
It is also our policy that our jobbers and distributors may handle whatever competitive products they choose.

We reserve the right to select our own customers, jobbers and distributors, but the retention of this right shall never be exercised as an indirect method of "tying" our products, or to establish an "exclusive dealing" policy. We also reserve the right to take legitimate and effective steps to prevent anyone from manufacturing, purchasing or using products which infringe any of our patents that have not been adjudged invalid by a competent court.

We have always subscribed to the policies announced above. If any of our sales personnel have violated these policies in the past, we sincerely apologize. Any future statements, representations or conduct in violation of these policies by anyone representing our company or selling our products, should be reported directly to me.

Thomas F. Peterson
President

Preformed Line Products Co.
1668 Union Commerce Bldg.
Cleveland 14, Ohio



Aerial Cable System

(9) *Kaiser Aluminum & Chemical Corp.*, 1924 *Broadway, Oakland* 12, *Calif.*

This spacer-type aerial cable system features a simply designed spacer, a new high-strength aluminum messenger and insulated phase conductors specially constructed for use with spacers.

Because all the elements are designed to be used together, an entire system, installed, costs considerably less than preassembled aerial cable and only slightly more than standard open wire, the manufacturer says.

Designed for systems operating at 5 to 15 kv, the spacer is described as a compact, high strength, one-piece Plexiglas unit with neoprene grommets. The grommets, slotted to slip around the cable, snap easily into the spacer's guide paths, but are held securely once they are in position. Only one cable need be handled at a time and installation of each spacer takes but a few minutes. With no movable or removable parts, the spacer has an extremely high degree of mechanical reliability, according to the manufacturer.

The cables are held 6 in. apart, providing a neat appearing system with easy phase identification.

Pole-Type Transformer

(10) *Pennsylvania Transformer Division, McGraw-Edison Co., Box* 330, *Canonsburg, Pa.*

A new 333-kva distribution transformer suitable for pole or platform installation has been added to Pennsylvania's line of Featherweight Pole Star transformers. Now included are single-phase ratings of 167, 250 and 333 kva, 15 kv and below.

According to the manufacturer, the new transformer is lighter and more compact than the station-type unit it replaces and provides better regulation. The average impedance is 2.5 to 3%, compared to an average of 4 to 5% for station-type transformers.

NEW KLEIN CATALOG

Here is the 1960 edition of the Klein catalog illustrating and describing the complete line of Klein tools and equipment for electricians.

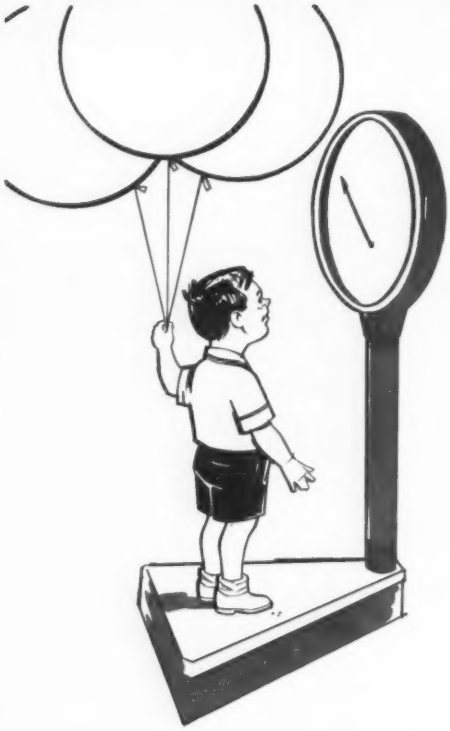
It contains many new additions to the Klein line—including Replaceable Gaff Climbers, a newly developed Hot Line Grip and an even wider range of pliers for every purpose.

The Klein Catalog 103 will be of interest to linemen, electricians —good workmen everywhere.

Write for yours.

Foreign Distributor: International Standard Electric Corp., New York.

Mathias Established 1857 KLEIN & Sons Chicago, Ill., U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS



don't let the numbers fool you

The hi-pot rating of a photoelectric streetlight control (the maximum *sustained** voltage it can take between its electrical and mechanical connections without breakdown) is important. If the hi-pot isn't high enough, the control may be an unexpected weak link in the system, behaving like a fuse instead of a switch.

Naturally the hi-pot rating of a control should be qualified by a description of the test method used. When a high, stiff voltage is applied to the control and "ground", the test is honest—but dangerous. A common practice is to insert a current-limiting resistor (on the order of 10 megohms) to take care of the danger—but then even a little leakage in the control will cause a big drop in the applied voltage, with the result that the hi-pot rating is falsely high. The voltage at the control is substantially less than the applied voltage as read on the meter, just as the indicated weight of the buoyed-up boy in the picture is less than his actual weight.

To get a "true" hi-pot rating, we eliminate the resistor and carry out the test in an insulated box which provides the necessary protection. Thus the voltage read on the meter *is* the same as that across the control. The new F-P bakelite-chassis 6600A controls will withstand a hi-pot test of at least 9 KV—honest. The Fisher-Pierce Co., 170 Pearl Street, So. Braintree 85, Massachusetts.

*as contrasted to "flash-over" effects caused by extremely brief, high voltage peaks.

FP
FISHER PIERCE
PHOTOELECTRIC LIGHTING CONTROLS
AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

Aerial Cable Spreader

(11) *Fargo Mfg. Co. Inc., 845 Main St., Poughkeepsie, N. Y.*

The porcelain construction of the S-1 aerial cable spreader provides known long-term dielectric and mechanical strength, the manufacturer states.

Six inches on center spacing of the conductor makes the S-1 ideal for 5-kv or 15-kv installations, it is claimed. The unit is mechanically capable of withstanding the forces generated by faults in excess of 10,000 amp and will support minimum dead weight loads of 1,500 lb, the announcement says. The weight (4¼ lb) dampens vibration and whipping under wind or short circuit conditions.

The porcelain and V-groove jaw design eliminates need of grommets and provides a range over insulation from ½ in. to 1½ in.

Distributed by Line Material Industries, Milwaukee, Wis.

Exciting Current Levels

(12) *Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.*

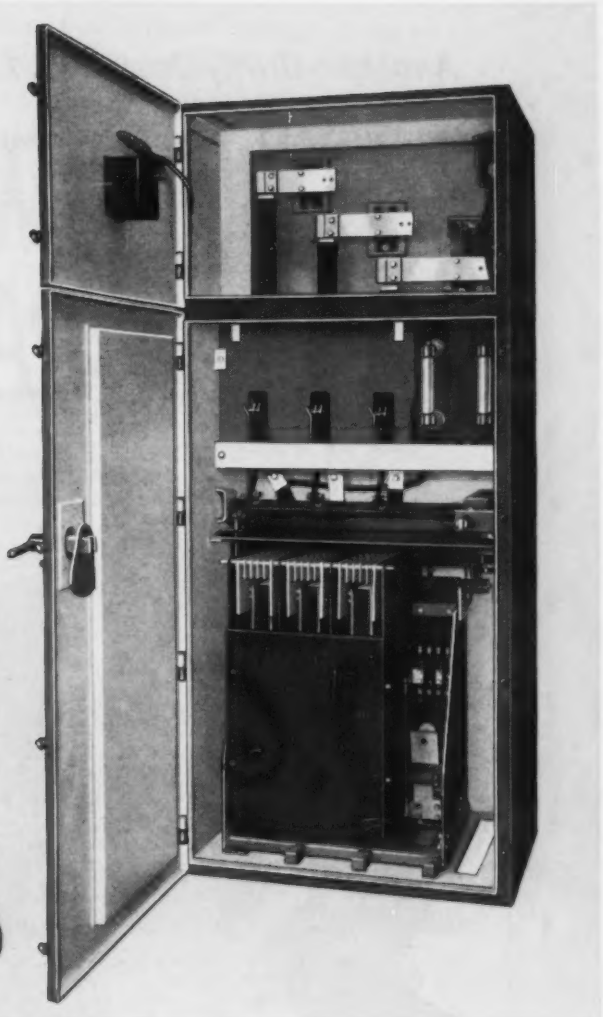
Lower guaranteed exciting current levels for its entire line of distribution transformers 167 kva and smaller in all voltage classes are available from Allis-Chalmers.

The new levels, up to 60% below those previously published, have been made possible through improved silicon steel handling and processing techniques, and transformer design changes, it is stated.

NEW EC&M STARTER

GIVES 100/150 MVA fault protection

WITHOUT FUSES!



Proven by tests conducted by an independent testing station, EC&M's new "fuseless" ZHA air-break starter has a certified interrupting capacity of 100,000 KVA at 2400 volts, 150,000 KVA at 4800 volts. This starter is simpler and much more accessible for inspection and checking connections.

The ZHA starter is not subject to problems associated with fuses. Single phasing due to blown fuses is eliminated...no costly replacement fuses to stock.

For positive personnel safety, the ZHA is equipped with a 3-way doorlatch, interlocked between disconnect switch and contactor interlocking system. The disconnect switch is gang-operated. When the door is open, disconnect blades are *visible* in the open and grounded position.

No roll-out needed...phase barrier and arc-chutes draw out horizontally, making front and rear contact tips readily accessible. Bus bars are used for power connections throughout the starter. Redesigned arc-chutes and interphase barrier, and improved contactor are additional features which make the ZHA starter your logical choice for high-voltage motor drives.

***GET THE COMPLETE STORY** on certified fuseless fault protection for high-voltage motor drives. Write for Bulletin 8130*
Square D Company, 4335 Valley Blvd., Los Angeles 32, Calif.

SQUARE D COMPANY

WHEREVER ELECTRICITY IS DISTRIBUTED AND CONTROLLED

Another Utility Installs...

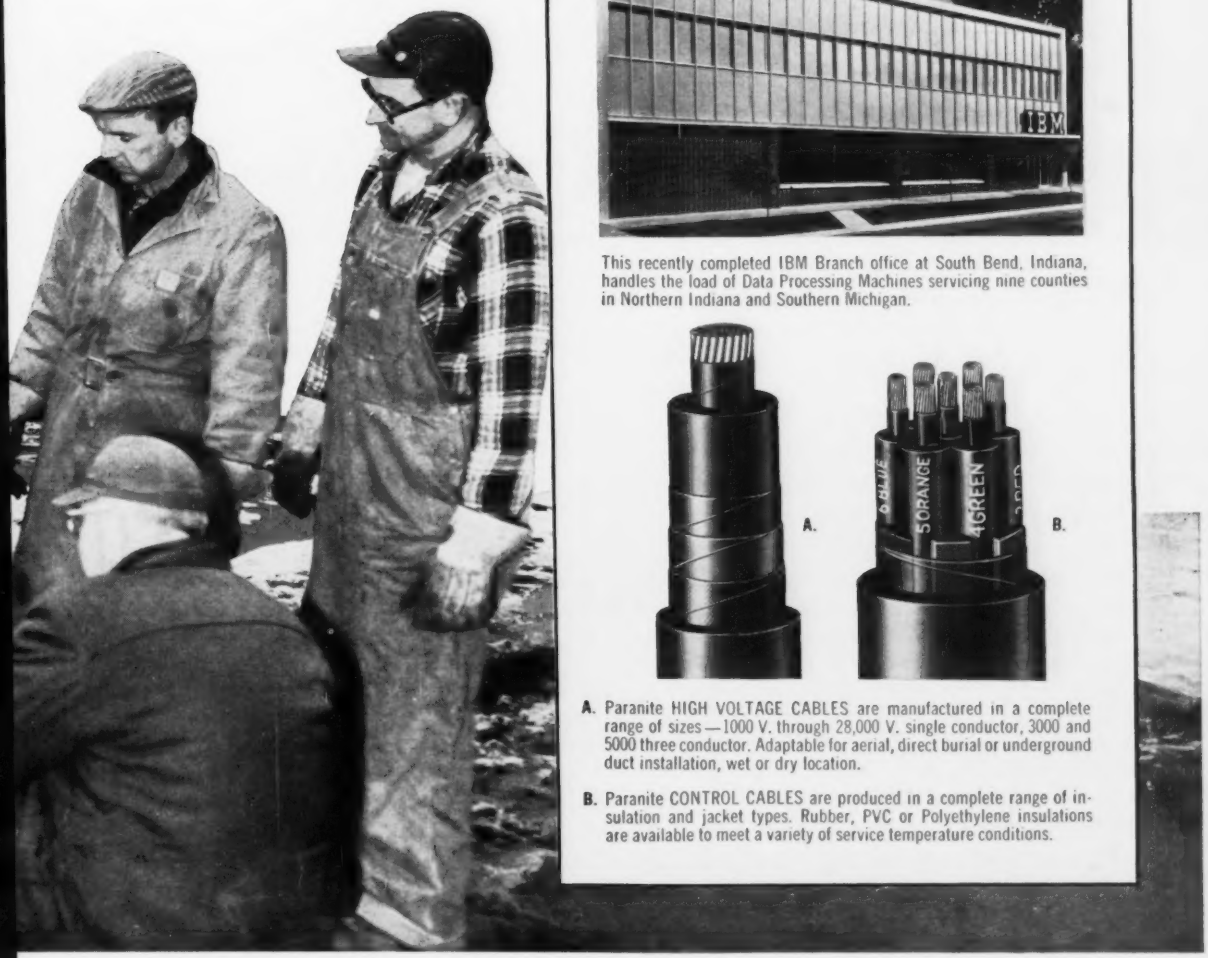
POWERIGHT PARANITE®

POWER CABLE

A modern electronic computor system at South Bend, Indiana, is serviced by Paranite Super-Pararite® Paraprene® network cable installed by the Indiana & Michigan Electric Company. Three Paranite network cables were laid parallel in underground ducts from the primary circuit to the new I B M building.

From 600 V. network through 28,000 V. power cables, Paranite has proven its dependability in coast-to-coast power installations. Paranite's engineering department invites your inquiry on specific problems relating to your application.

PARANITE WIRE & CABLE PRODUCTS
WIRE AND CABLE DIVISION
ESSEX WIRE CORPORATION, Marion, Indiana
MANUFACTURING PLANTS: Marion, Ind.; Jonesboro, Ind.; Tiffin, Ohio; Anaheim, Calif.
Sales Offices and Redistribution Warehouses in all Principal Cities

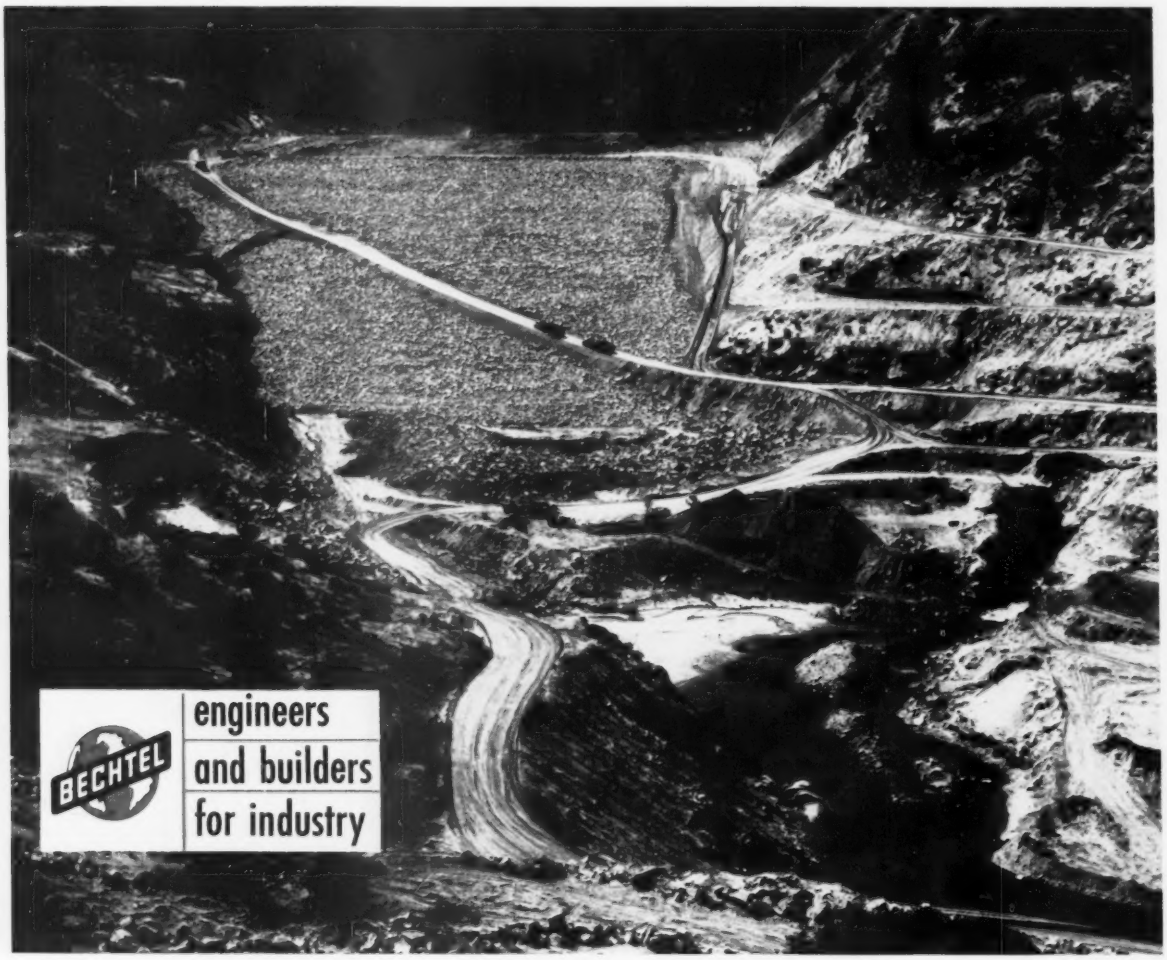


This recently completed IBM Branch office at South Bend, Indiana, handles the load of Data Processing Machines servicing nine counties in Northern Indiana and Southern Michigan.

A. Paranite HIGH VOLTAGE CABLES are manufactured in a complete range of sizes—1000 V. through 28,000 V. single conductor, 3000 and 5000 three conductor. Adaptable for aerial, direct burial or underground duct installation, wet or dry location.

B. Paranite CONTROL CABLES are produced in a complete range of insulation and jacket types. Rubber, PVC or Polyethylene insulations are available to meet a variety of service temperature conditions.

For phone number of closest representative see advertising index in back of book.



Bechtel Experience Helps Create a

NEW JOB FOR A BUSY RIVER

In a major expansion of Southern California Edison Company's Big Creek System, Bechtel has just completed the Mammoth Pool Dam on the San Joaquin River.

The dam is one of the world's highest rolled earthfill dams—469 feet high from foundation to crest, and 825 feet long. It creates a storage reservoir with 123,000 acre feet capacity as a key feature in the Mammoth Pool power development. An 8-mile tunnel carries water from the dam to a new power house which will have a peak capacity of 150,000 kilowatts. The new power house will go into operation this Spring.

Bechtel's depth of experience in the power field, combined with the ability to collaborate closely with Edison's engineers, has worked advantageously for this long-time client—achieving important construction and operating economies on many of its major new projects.

We invite inquiries on any aspect of hydro-electric, steam or nuclear power generation.

BECHTEL CORPORATION

SAN FRANCISCO • Los Angeles • New York • Houston

CANADIAN BECHTEL LIMITED

Montreal • TORONTO • Calgary

For phone number of closest representative see advertising index in back of book.

Synthetic Rope

(13) *Petersen Engineering Co. Inc., 460 Kifer Road, Santa Clara, Calif.*

A synthetic rope designed for pulling in overhead electrical conductor on transmission and distribution lines is being marketed under the trade name of PENGO-Prope.

Features listed: excellent dielectric characteristics; waterproof; not adversely affected by salt water; will not mildew; extremely strong and very light; is the only construction in synthetic ropes satisfactory for tension stringing.

According to the manufacturer, PENGO-Prope handles and splices like manila; but because of its greater strength, smaller diameters can be used.

Pad-Mounted Transformers

(14) *Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14, Mo.*

Sub-Urban pad-mounted distribution transformers are designed for surface mounting on a concrete pad, through which both the primary and secondary underground cables are brought into a tamperproof enclosure for connection to terminals.

Pad-mounted transformers can be screened with shrubbery so as to blend into the landscaping of the area. In addition, they provide maximum operating efficiency, service continuity, complete safety, low maintenance cost, and are easily adapted to handle future load growth, the manufacturer states.

This newly developed line comes in single-phase ratings 25 through 167 kva and three-phase ratings 75 through 500 kva, 15 kv and below.

PVC ROYALOK

Caps and Connectors interlock with a twist of the wrist . . . give you rugged, positive, fail-proof power connections.

Unbreakable molded vinyl bodies—can't crack, chip, or break . . . hold blades and contacts solidly in place. Resistant to acid, oil, and grease.

Safer, stronger construction— Dead-front caps eliminate nuisance of fiber washers and dangers of exposed conductors. Internal barriers separate conductors. One-piece connectors have heavy brass double-wipe contacts locked in solid vinyl

ORDER FROM YOUR WHOLESALER, OR WRITE FOR CATALOG 2-58-4.

QUICK, CLEAN WIRING 3 Simple Steps!

1. Remove cord grip plate by loosening plate screws (they can't fall out).

2. Insert cord thru clamp, strip conductors and connect to terminals.

3. Replace grip plate, tighten screws — that's all!

A Broad Line of ROYALOK Interlocking* Devices

2-Wire Polarized	3-Wire Polarized Grounded	4-Wire Grounded
10 Amp — 250V 15 Amp — 125V 20 Amp — 250V Dead-front caps . . . one-piece connectors	10 Amp — 250V 15 Amp — 125V 20 Amp — 250V 10 Amp — 600V Dead-front caps . . . one-piece connectors	20 Amp — 250V 10 Amp — 600V Dead-front caps . . one-piece connectors

*Fit all standard interlocking devices

ROYAL ELECTRIC

...an associate of UL

ROYAL ELECTRIC CORPORATION

PAWTUCKET, RHODE ISLAND

SALES REPRESENTATIVES AND WAREHOUSES: Los Angeles—1950 Naomi Avenue, RI 7-9655; **San Francisco**—1225 Sixth St., HE 1-5792; **Seattle**—4130 First Ave., So., MA 3-8882; **Denver**—888 S. Lipan Street, WE 6-3456

SOUTHERN STATES OFFERS THE MARGIN OF SAFETY NEEDED IN AIR SWITCHES TODAY AND TOMORROW

The switches shown here are brand new. They will pass any industry standard short circuit test with ease.

But what about 10 years from now, when the switches are covered by grime and grit; when operation has caused some wear of the contact surfaces?

What's going to happen *then*, when heavy fault currents occur? Are the critical current interchange points going to stand up to the task of protecting your valuable load?

These are questions that must be answered by engineers concerned with today's complex transmission and distribution problems. Basic switch design, quality of construction, and the type of contacts used deserve critical appraisal. The contact is most important.

Southern States provides extra security for its air switches by using Amplitact® contacts. Since this contact was introduced about 10 years ago, *not a single one has ever failed under short circuit.* This is the margin of safety you need.

Look beyond the catalog and technical data—look to the future capabilities and trustworthiness of the switch you buy.

High density, high load areas demand maximum protection against higher values of fault current. That is why so many utilities throughout the nation are using Southern States Air Switches with Amplitact Contacts.

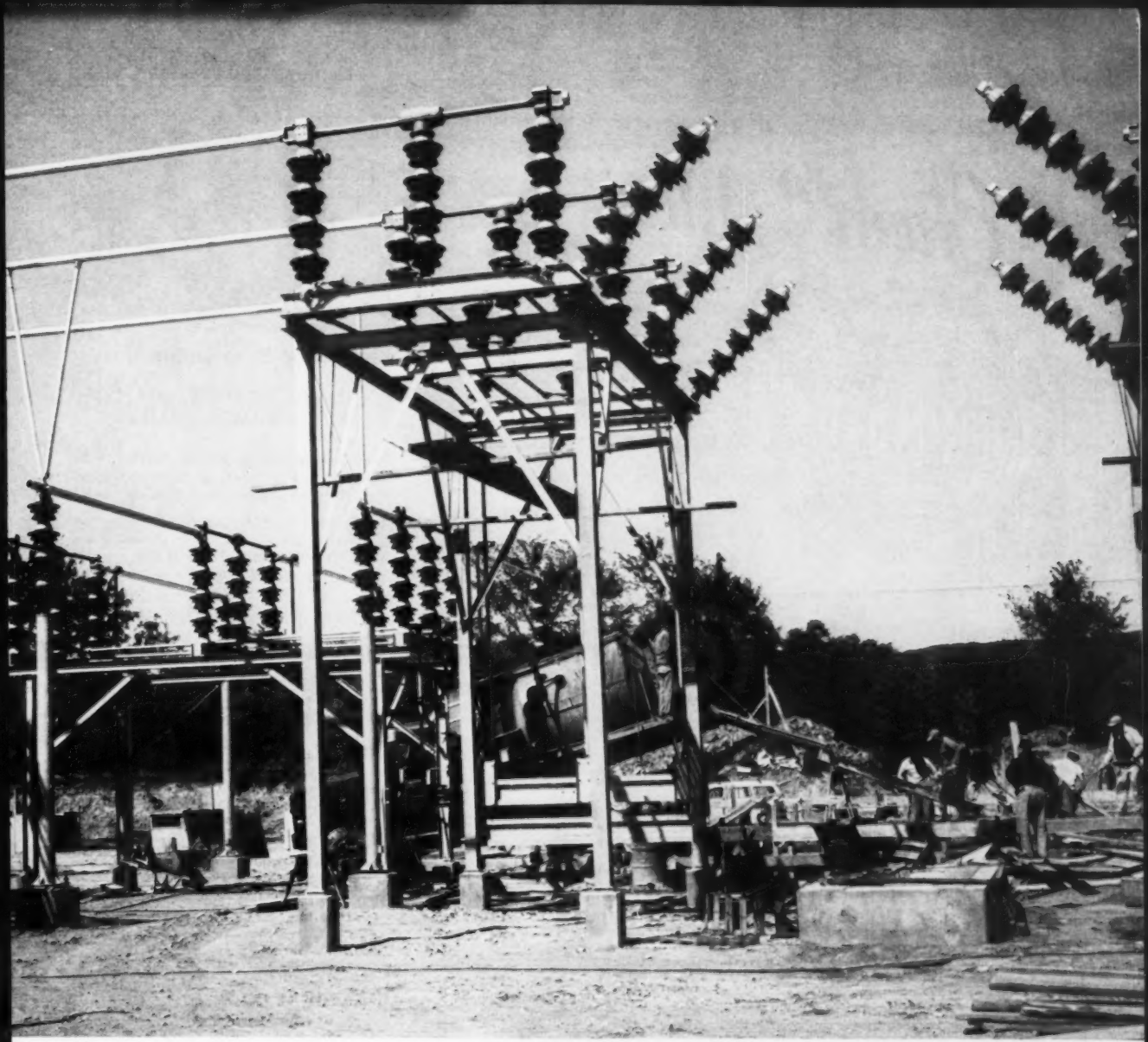
Get the facts from your Southern States representative, or write direct for details.

SHORT CIRCUIT TESTS OF SOUTHERN STATES SWITCHES EQUIPPED WITH *AMPLITACT* ® CONTACTS

KV	CONT. CURRENT RATING	TEST SHOTS			TEST RESULTS
		NO. OF TESTS	RMS AMPERES MAXIMUM	RMS AMPERES MINIMUM	
161	1200	12	62,900	51,200	No Damage
		6	79,000	60,000	No Damage
		6	80,300	69,700	No Damage
		9	84,500	74,600	No Damage
		9	98,000	78,400	No Damage
		3	106,800	89,800	Pressure Marks*
161	2000	7	70,500	58,600	Pressure Marks*
161	1600	8	70,000	53,700	No Damage
		1	114,000		Pressure Marks*
		6	82,000	65,300	Pressure Marks*
161	1600	5	106,100	99,500	Pressure Marks*

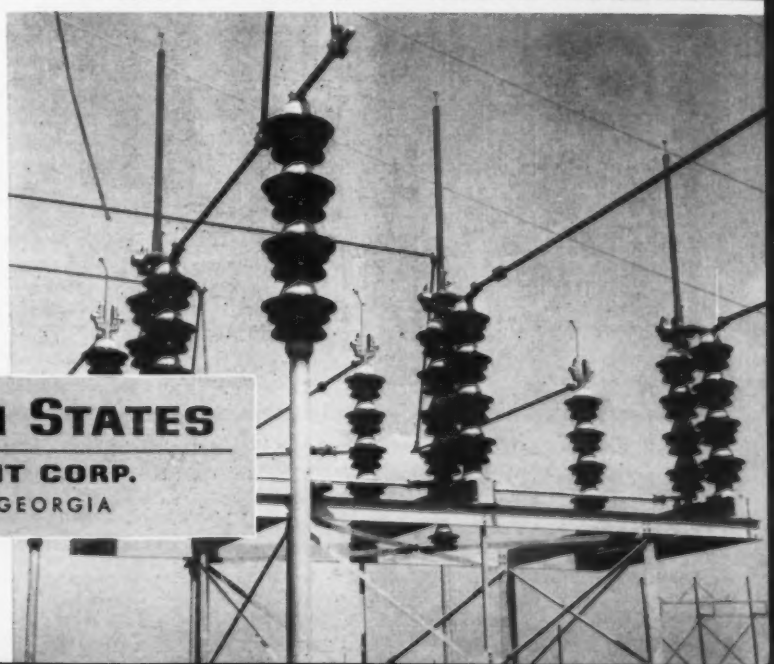
**The term "Pressure Marks" should in no way be construed as an indication of damage to the contact. Instead it points up the extremely high contact pressures which were developed by* AMPLITACT® *and were anticipated in the design of this type contact.*

KEEP PACE ELECTRICALLY



ABOVE Consolidated Edison's Buchanan Substation is shown here during construction. Southern States' 161 KV—2000 amp Type RDC double side-break switches and 230 KV—1600 amp Type WAG switches (not shown) are the Amplitact equipped air switches used on this station.

AT RIGHT Houston Lighting & Power Company uses 161 KV—1200 amp Type WAG air switches on this modern substation.



SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA Dominion Cutout Co., Ltd., Toronto

RESISTS CORROSION

This new super line of "Chem Marine" devices are engineered from corrosion resistant materials capable of withstanding the harmful effects of moisture, brine, grease, oils and many acids. They are designed for industrial applications such as plating rooms, shipping platforms, yards, shops, warehouses, or wherever corrosion or chemical action is a problem.

Special Materials:

"INSULPRENE"—a Du Pont neoprene compound.

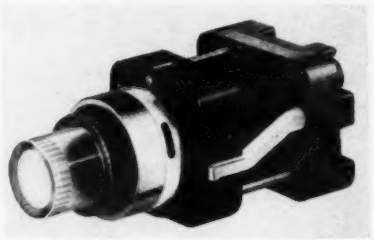
"MONEL® METAL"—Reg. Trademark of INCO.

"MELAMINE"
"CYMEL®"—Reg. Trademark of Am. Cyanamid

HEAVY NICKEL-PLATED CURRENT CARRYING PARTS.

"Chem Marine" devices are identified by their bright yellow color and a few representative items are illustrated above. For complete information contact the "Chem Marine" Department.—

HARVEY HUBBELL, INCORPORATED
BRIDGEPORT 2, CONNECTICUT, In Canada: Scarborough, Ontario



Illuminated Push Button

(15) *Square D Co., 4335 Valley Blvd., Los Angeles 32, Calif.*

This illuminated push button was designed to save mounting space and installation time by combining in a single device both a push button and a pilot light. The new device features pressure connectors to eliminate internal wiring. Terminals are clearly marked for easy wiring.

The push button has the same single-hole mounting as other oiltight units. It is available with a button guard to prevent accidental operation. A full range of voltage ratings and a choice of six color caps are provided. Contacts are rated for heavy-duty service.

For details, write for bulletin 9001-T.

Aerial Cable Clamps

(16) *Malleable Iron Fittings Co., Branford, Conn.*

Recently added to the MIF aerial cable hardware line are standard-type cable suspension clamps. These clamps are said to offer generously belled grooves for maximum protection to cable messengers, without additional cost. Two types are listed. Both are supplied with ½-in. diameter track bolts and are designed for mounting with machine or double arming bolts that also serve as a third clamping bolt. For added clearance from the pole, additional nuts or washers can be used.

Guide Line Tape

(17) *L. Frank Markel & Sons, Norristown, Pa.*

Flexite silicone rubber triangular guide line tape is said to be a permanently resilient, self-adhering, self-fusing tape for void-free insulation with long life, resistance to corona, oils, weathering, abrasion. The guide line cuts taping time, insures a perfect lap with uniform thickness, the manufacturer claims. Samples and data on request.

BULLETINS ETC.

(18) POWER-CENTER PLANNING—Available from R. E. Uptegraff Mfg. Co., Scottdale, Pa., this power-center substation planning guide includes drawings, dimensions, weights, performances and other data on basic units of load center transformers, with complete details of standard transformer arrangements for use with switchgear and other equipment. A variety of terminal appurtenances is included to permit a choice of standardized arrangements to meet individual requirements.

(19) REGULATORS—Features of Allis-Chalmers JFR distribution voltage regulator are given in a 16-page bulletin available from the manufacturer at Milwaukee 1, Wis. The new regulator's smaller size, up to 33% in height and weight, assures greater versatility in pole, platform and substation mounting, it is stated.

(20) UNDERGROUND DISTRIBUTION—G-E's Bulletin GEA-6981 describes features, installation and application of pad-mounted transformers (complete distribution units rated 25 to 100 kva) and semi-buried transformer enclosures for pole-type distribution transformers up to 167 kva. Available from General Electric Co., Schenectady 5, N.Y.

(21) TRANSCLOSURES—A bulletin describing Transclosures for housing distribution equipments at ground level has been released by Line Material Industries. This equipment is used for underground distribution systems serving residential, industrial or commercial areas; supplying highway lighting circuits; or for systems requiring automatic switching equipments. They enclose standard overhead distribution transformers or other apparatus rated 2.4 kv through 14.4 kv. Designated CM1, this bulletin is available from Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis.

(22) CLEVISES—Porcelain Products is offering literature on its insulated clevises listing complete specifications for swinging and standard types. These clevises are designed for dead-ending service drops at either end and for general use in commercial and industrial service. Copies of the bulletin are available from Porcelain Products Co., 225 N. Patterson St., Carey, Ohio.

(23) ELECTRICAL CORDS—Improvements in rubber jacketed Bronco 40 portable electric cords are listed in a new brochure offered by Western Insulated Wire Co. Copies may be secured from Richard O. Pallin, assistant sales manager, Western Insulated Wire Co., 2425 E. 30th St., Los Angeles 58.

(24) INSTRUMENTS—Bulletin GEZ-2975 describes instruments for the electric utility industry—for generating plants, distribution areas, load-dispatching offices, substations and electrical testing. For further information on these products, a table lists the appropriate General Electric descriptive publication number and apparatus handbook section. Available from General Electric Co., Schenectady 5, N.Y.

KILL TWO BIRDS WITH ONE STONE—Fill out this coupon and get back valuable information from as many sources as you indicate.

ELECTRICAL WEST
68 Post St., San Francisco 4, Calif.

Not good after May 1

Please send me, without obligation, the new product information or catalogs:

If described in Product News, circle item number

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24

If described in advertising, fill in page number

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

*Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

*Trademark

"Superformed* spells S-A-F-E-T-Y to a SAFETY SUPERVISOR"

"We Safety Men must look at any piece of equipment from the *safety* angle.

"Fanner Superforms? Sure, they are safer for our linemen to handle. Not unwieldy . . . no tools required for dead-line application . . . easily controlled with hot-line tools . . . ends are carefully machined to prevent rubber-glove puncturing . . . safer than straight wires and aluminum ribbon."

Everywhere, Safety Engineers, *the men who guard the safety of people*, have a good word for Superforms.

A-1583A

FANNER Superformed with a "PROTECTIVE TWIST"

ARMOR RODS . . . Protect long-span T&D lines at supports

LINEGUARDS . . . Protect short-span T&D lines at supports

PATCH RODS . . . Repair damaged conductors

TAP ARMOR . . . Protects conductor at tapping points

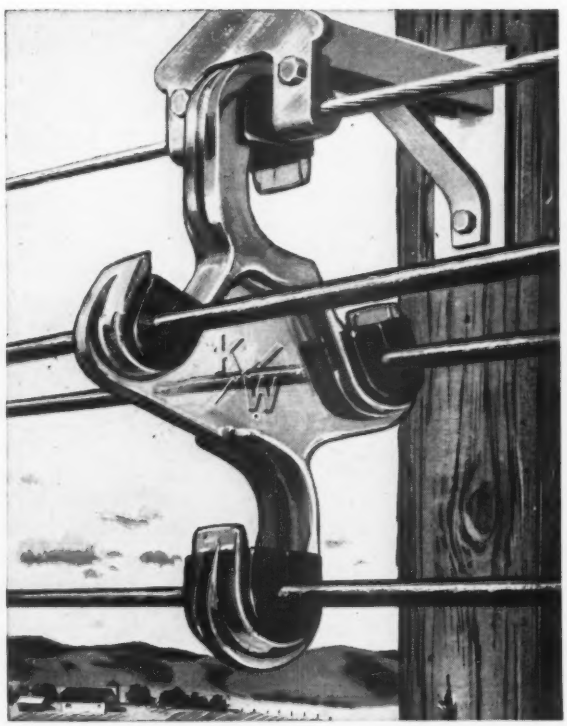
FANNGRIPS . . . For dead-ending strands and conductors

FANNSPLICES . . . Join two ends of conductor wire

PLASTIC PRODUCTS . . . For conductor surface protection

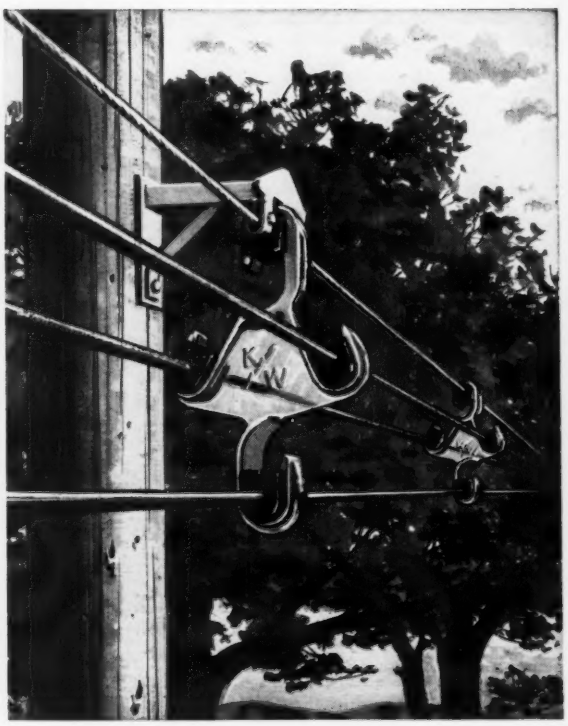
FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

NEW K/W SPACER TYPE AERIAL ADDS STRENGTH, CUTS COSTS,



One-Piece Design—Supports 1200 Pounds

New solid spacer design has no loose parts nor movable pieces . . . it's simple, reliable and strong. Can support a minimum distributed load of 1200 pounds. Easy to install, since only one conductor is handled at a time. Snap-in grommets shaped to ease installation. Can be used with or without crossarms; standard hardware available from many suppliers.

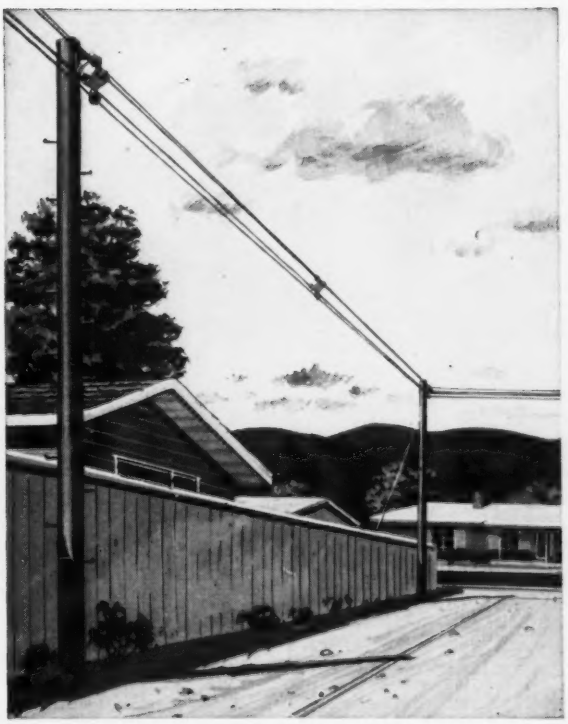


Cuts Material Costs and Tree Trimming

A KW Spacer Cable system can be installed for as little as one half the cost of standard pre-assembled aerial cable!

Compared to open-wire weatherproof, the reduced tree trimming and improved system dependability resulting from messenger supported cables can justify the spacer system's slight additional cost.

CABLE SYSTEM IMPROVES APPEARANCE



Reduced Spacing Improves Appearance

Compared to open wire, closely spaced conductors present a neat, compact arrangement that improves appearance wherever it is installed. Close 6-inch spacing also improves system electrical characteristics . . . permits easy phase identification and proper load balancing. Usual installation practice is approximately 35 spacers per 1000 feet.

WITH its unique new spacer design, KW now offers you unsurpassed dependability and handling ease for cable systems operating at 5 to 15 kv, by using only one spacer for the whole range of voltages.

No tools or tightening necessary: entire spacer system snaps in and locks.

The system consists of four parts: (1) Phase conductors (EC grade aluminum, minimum conductivity 62 per cent, insulated with Polyethylene or Butyl rubber with Neoprene jacket); (2) Special high-strength messenger; (3) Molded one-piece spacers; (4) Molded Neoprene cable-retaining grommets.

Standard hardware is available from leading suppliers. Call your Kaiser Aluminum sales office or KW distributor for immediate service and full information.

Kaiser Aluminum & Chemical Sales, Inc., 300 Lakeside Drive, Oakland 12, California.

KAISER ALUMINUM*

"IF IT CARRIES CURRENT, KW CARRIES IT!"

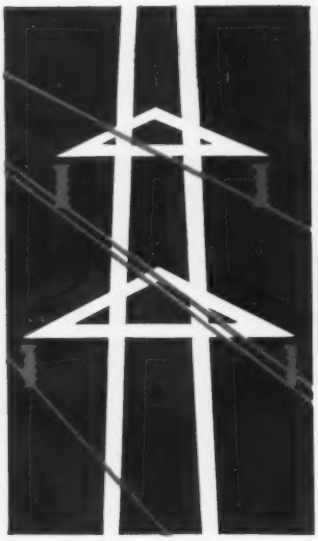
*TRADEMARK KAISER ALUMINUM & CHEMICAL CORPORATION

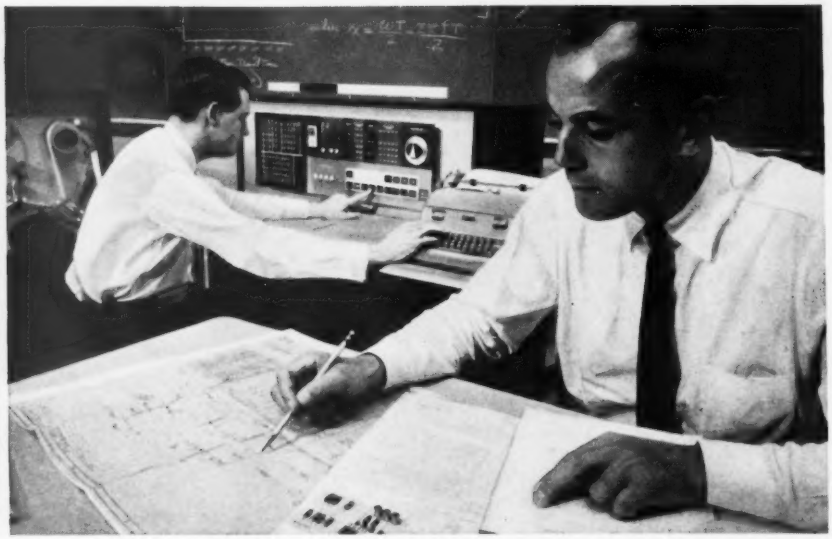
See "MAVERICK" • Sunday Evenings, ABC-TV Network • Consult your local TV listing.

For phone number of closest representative see advertising index in back of book.

IBM 1620 *data processing system*

...the most powerful engineering computer in its low price class





In the Electric Utilities Industry the IBM 1620 solves problems like these:

- *systems planning and simulation*
- *load flow computation*
- *short circuit studies*
- *economic fuel purchase*

The new IBM 1620 is a desk-size engineering computer that offers you more computing ability per dollar than any system in its price class.

Transistorized throughout, the IBM 1620 has a 20,000-digit magnetic core memory with variable field length and immediate accessibility. Its input-output notation, on paper tape and console typewriter, is in convenient decimal arithmetic. It can perform more than 100,000 calculations a minute and is easily adapted to your engineering problems.

Easy to learn, easy to operate, easy to communicate with, the low-cost 1620 helps free your engineering talent for more creative work. And in keeping with our concept of Balanced Data Processing, the IBM 1620 is supported by extensive services. This includes a comprehensive library of mathematical routines and specific industry programs to permit you to put the 1620 to work without unnecessary delay.

Ask your IBM representative about the unique advantages of the IBM 1620. Like all IBM equipment, it may be purchased or leased.

IBM® *balanced data processing*

For phone number of closest representative see advertising index in back of book.

Manufacturers—Distributors

Electrical Manufacturers Target of Trust Busters

A series of indictments charging price fixing and collusion in bidding on a wide variety of electrical equipment items was handed down by a Philadelphia federal grand jury last month against 12 major electrical manufacturing firms. The first announcement of government action against industry came on Feb. 16 when three separate indictments charged General Electric, Westinghouse, Allis-Chalmers, I-T-E Circuit Breaker and Federal Pacific Electric Co. with violations of the Sherman Anti-Trust Act in sales policies concerning switchgear and circuit breakers. The next day additional indictments charged a conspiracy to fix prices on bushings, lightning arresters, insulators and overfused cutouts. In addition to the companies mentioned above, the Lapp Insulator Co., Ohio Brass Co., McGraw-Edison Co., H. K. Porter Co., Hubbard & Co., Joslyn Mfg. & Supply Co., Porcelain Insulator Co., A. B. Chance Co. and Southern States Equipment Corp. were named.

Eighteen individuals, all employees of the various companies, also were charged with violations of the Sherman Anti-Trust Act. Justice department representatives hinted that investigation was being made in other lines of products.

The indictments name places and dates where the defendants allegedly met to discuss prices, go into some detail concerning the methods supposedly used to allocate business in oil circuit breakers and switchgear and set forth in detail the alleged percentages of business on those products to be allocated to the various defendants. Each charge carried a penalty of up to a $50,000 fine or a year in prison, or both.

(See editorial p 1.)

Veterans Retire

Retirement of two veterans, both well known to the electrical industry of the Pacific Northwest, has made a change in the personnel of the Portland office of General Electric's Apparatus Sales Division.

First to retire was W. I. Nicholson, sales engineer. He had been 44 years with G-E, the past 25 years in Portland after earlier service in Spokane. R. C. "Dick" Johanson was transferred from the Seattle office as his replacement.

To retire March 31 is R. V. "Rufe" Maier. In his 42 years as a G-E apparatus salesman in southern Washington and northern Oregon, he has specialized in the pulp and paper industry as well as utilities. Neil D. Lafromboise will move to Portland from Tacoma to replace him.

New Firm Formed At Oswego, Ore.

Powerdyne Inc., new firm formed by three Oregon engineers for manufacture of pole-top switches, began production last month at its new factory in Oswego, Ore.

The firm is producing four switch models, designed for use with energy from 7.5 to 69 kw.

The company was formed by Henry H. Schwager, president, Portland; Charles E. Kerr, secretary, Hillsboro; and Clarence C. Bragg, treasurer, Oswego.

Schwager is former manager of engineering for Schwager-Wood Corp. Kerr was formerly employed in the production engineering division of Food Machinery Corp. Bragg is a former general foreman of production for Westinghouse.

► **William Brand Wire & Cable** Co., Santa Monica, Calif., has appointed **Frank Stefkovich** as Western Division sales manager. He was assistant chief engineer of the Willimantic, Conn., plant before transferring to California as assistant to the plant manager in Santa Monica. He will retain that position and will be assisted by **Frank Saunders,** recently appointed as assistant sales manager, Western division.

► **Gerald M. Ireland** has been appointed manager of the **Westinghouse** Emeryville plant, succeeding **Edmund S. Holt,** who has retired after almost 47 years with the company. Ireland attended the University of Washington before joining the Westinghouse manufacturing and repair department at Seattle in 1930. In 1946 he was transferred to Salt Lake City, where he served as shop foreman before being named manager. **Fred C. Murdock** has succeeded him as manager at Salt Lake.

GARDEN SETTING at the new Los Angeles showroom of Lightolier. The 8,000-sq-ft display space is in a newly constructed building at 2515 S. Broadway. Other areas are designed for formal and informal residential, commercial and institutional lighting. The building represents an investment in excess of $500,000, and is the most elaborate ever set up by the company, according to N. A. Blumberg, vice-president in charge of Western sales. While Lightolier has been conducting business in the West for many years, it has not had local production and warehouse facilities before, he said. Private previews were held for lighting people, electrical contractors, architects and decorators

It took 29 yrs. research to make

JAQUES Hydraulic HOLE DIGGERS

Fastest, Strongest, Safest most economical!

Jaques TJ-254 digging at 30-degree angle. Operates at up to 45 degrees.

Time-and-money-saving features of Jaques All-Hydraulic Hole Diggers took 29 years to develop. Rugged, versatile Jaques TJ-254 mounts on standard trucks, drills holes up to 48" diameter, to 25' depth, in hardest soil or rock — FASTER, CHEAPER, EASIER than competitive machines! Fewer moving parts insures ***minimum down-time, maintenance, operating costs.*** Shock-resistant device relieves strain in rock digging. Simple to operate with only 3 primary adjustments. FREE DEMONSTRATION WILL PROVE THESE CLAIMS!!

-----FREE----

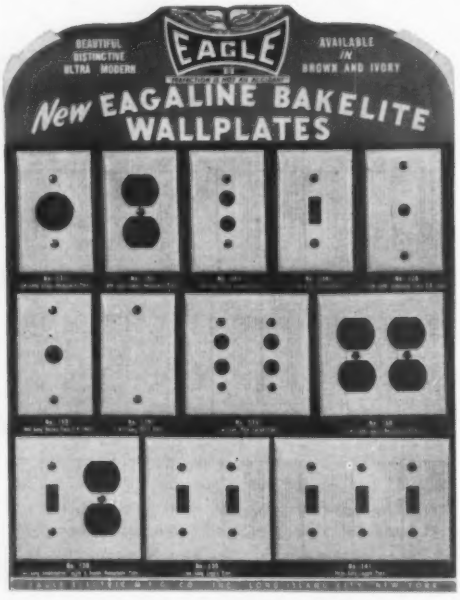
TEXOMA ENTERPRISES, INC.
HIGHWAY 75 North, SHERMAN, TEXAS

☐ Send me FREE detailed literature.
☐ Have representative call. No Obligation.

NAME_____
TITLE_____
ADDRESS_____
CITY_____
STATE_____

TEXOMA ENTERPRISES, INC.
HIGHWAY 75 NORTH • SHERMAN, TEXAS

TO BE SURE — SPECIFY EAGLE
NON-INFLAMMABLE WALL PLATES



ASK YOUR EAGLE REP FOR THIS **FREE** DISPLAY

See the Big Surprise
At Eagle Booth 305-307
5th Nat'l Electrical Industry Show
New York Coliseum
March 6-7-8-9

"PERFECTION IS NOT AN ACCIDENT"
EAGLE ELECTRIC MFG. CO., INC., LONG ISLAND CITY, N. Y.

► **M. R. "Milt" Van Zanten** is new president of **Swan Mfg. Co.**, Vancouver, Wash., manufacturer of Vecto-Ray baseboard heaters, wall heaters and thermostats. William L. Muyskens, chairman of the board, announced the appointment and that of William Leiner as vice-president in charge of production and secretary-treasurer.

Van Zanten

Van Zanten joined the firm in 1956 as factory representative and more recently was advertising and public relations director. Leiner owned his own company prior to joining Swan.

Swan recently announced plans for a quarter-million-dollar plant expansion program to be completed by the first of next year.

► **R. L. Sutherland** has been made plant superintendent of the **Kelman Power Circuit Breaker Division of I-T-E,** A. E. Mackenzie, I-T-E vice-president and general manager of the Los Angeles division, announced. Formerly production manager and assistant plant superintendent, Sutherland succeeds **A. F. Peterson,** who is retiring after 39 years with the company.

Sutherland

► **Tri-State Supply** Co., Los Angeles, has been named West Coast distributor for Du Pont's new armalon insulation. The product is a resin-coated glass fiber material, available in flexible and rigid laminated form. Specially suited for use in electric motors and transformers, the material can withstand temperatures ranging from -125 F to 622 F, it is stated.

► **Mil-Spec Supply,** 17468 Ventura Blvd., Encino, Calif., has been appointed representative and authorized distributor of Turbo Brand wire and cable products in southern California for both **William Brand Wire & Cable Co.,** Santa Monica, and **William Brand & Co.,** Willimantic, Conn. **Plastic Center** will continue to serve as southern California representative and distributor for all William Brand tubing products.

Thompson

Congdon

► **Al Thompson** has been made Bay Area sales manager for **Prescolite Mfg.** Corp. of Berkeley. He has served as Bay Area salesman and most recently was a representative in the Colorado-Wyoming area. **Donald Congdon** will replace him at Denver. Congdon was manager and sales engineer with Ryall Electric Supply at Denver before joining Prescolite.

► **Jeremy M. Ets-Hokin** became president of **Ets-Hokin & Galvan** and his father, Louis Ets-Hokin, made chairman of the board of directors in a reorganization of the electrical contracting firm that has branches in Wilmington, San Diego, Oakland, Stockton, Sacramento and Monterey. It also has field offices in 14 states, and a manufacturing subsidiary, CEMSCO, headquartered in Wilmington. **Robert S. Lauter** was made executive vice-president. He was formerly legal and financial vice-president. Other appointments by the board of directors include **Milton H. Schug,** Los Angeles branch manager, first vice-president; **A. C. Eddy** and **Fred L. Byrum,** San Diego branch co-managers, second and third vice-presidents, respectively; and **William A. Brown,** Los Angeles branch, fourth vice-president. Jeremy Ets-Hokin is a graduate of Stanford University; Lauter of the University of California and Hastings Law School. The firm originally started as a marine electrical contracting business.

► **Leo A. Hansen** Jr. has been named Pacific Coast retail sales manager for the **Westinghouse Lamp Division** with headquarters at the region sales office in San Lorenzo, Calif. Hansen was active in sales and marketing activities for a number of years before joining Westinghouse in 1948 as a sales representative in the Salt Lake City district. In 1957 he was promoted to assistant to the sales manager, Pacific Coast region, a post being taken over by Fred O. May, lamp sales representative in San Francisco.

► **General Electric, Construction Materials** Division, has established a new sales section in Los Angeles to promote electric heating. The new office will be headed by **Ralph Luciano** who will be replaced in wiring device sales by **G. G. Leavitt,** most recently with the G-E factory in Providence, R.I.

► **Tele-Jac Co.,** 2200 Tyler Ave., El Monte, Calif., has announced new sales representatives: **J. W. Reynolds Co.,** Salt Lake City; **Easter-Owens Electric** Co., Denver; **Sanderlin** Co. of Seattle, Portland and Spokane; **Gordon W. Laursen & Son,** Albuquerque.

► **Industrial Engineering & Equipment** is holding a series of demonstrations on the large Jaques hydraulic earth boring machine. The demonstrations are being held for utility people at different locations in the Los Angeles area. The machine is the No. k 3-30 Jaques produced by Texoma Enterprises.

► **Donald D. Scarff,** formerly Western region sales manager was made general manager of **G-E's large lamp department.** He replaces **Herman L. Weiss,** Lamp Division general manager, who had been acting manager of the department.

RIGID *Conduit*
PIPE COUPLINGS

IN STOCK
½" to 6" sizes
ALUMINUM
BLACK ENAMELED—
HOT DIP GALVANIZED

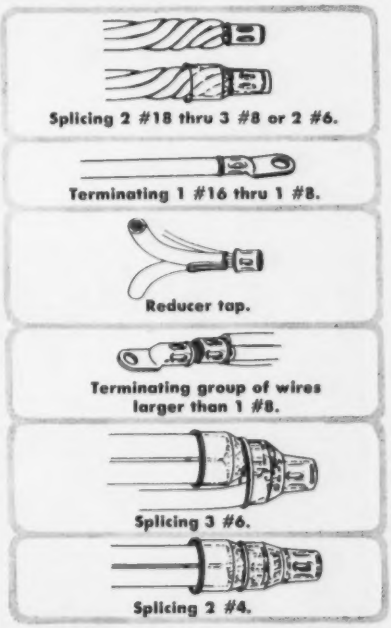
2

CONDUIT NIPPLE MFG. CO.
1455 SPRING GARDEN AVE. PITTSBURGH 12, PA.

do all these wiring jobs and more with just one BUCHANAN pres-SURE-tool

You use *just* one Buchanan C-24 pres-SURE-tool to install both Buchanan Splice Caps and Buchanan Termend® lugs. Only two sizes of all-copper Splice Caps splice from 2 #18's thru 3 #8's or 2 #6's. Just one size all-copper Termend lug terminates from 1 #16 thru 1 #8 (or any equivalent combination of 2 or more wires).

Buchanan Splice Caps and Termend lugs are self-positioning in the tool and provide high strength, vibration proof connections.


Splicing 2 #18 thru 3 #8 or 2 #6.
Terminating 1 #16 thru 1 #8.
Reducer tap.
Terminating group of wires larger than 1 #8.
Splicing 3 #6.
Splicing 2 #4.

Write for pres-SURE-TIPS —showing how Buchanan pres-SURE-connectors do the work of two, three or four conventional solder or solderless devices. Ask for Bulletin W-3

Approved for splicing 2 # 18 thru 3 #8 or 2 #6 and for terminating 1 #16 thru 1 #8. Insulators approved for 600 volts on building wire, 1000 volts in fixtures -in applications to 105°C. (221°F.).

STOCKED BY LEADING ELECTRICAL DISTRIBUTORS EVERYWHERE

BUCHANAN
ELECTRICAL PRODUCTS CORPORATION
HILLSIDE, N. J.

Booth 203
Electrical Industries Show
Los Angeles–Mar. 23-26

ANOTHER STEP AHEAD IN VOLTAGE REGULATION

APPLICATION ENGINEERING

INSTALLATION SERVICE

LINE CREW TRAINING

RAPID PARTS SHIPMENT

These General Electric Voltage Regulator

SERVICES MEAN SAVINGS

Savings for you through economical application, installation, operation, and maintenance are a big part of General Electric's voltage regulator story.

When you buy reliable G-E regulators you receive these added values in service:

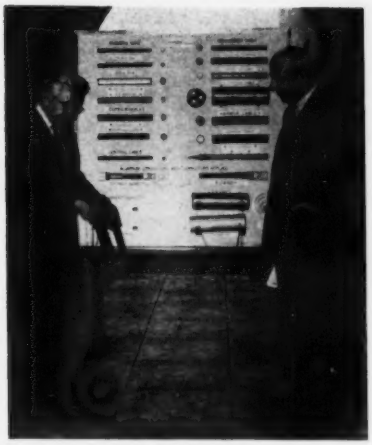
- Engineering assistance during planning stages of modern distribution systems gives you benefits of latest application concepts and computer-augmented system regulation studies.
- Installation guidance on-the-site by G-E regulator engineers assures proper hook-up, continued economical operation.
- Factory trained G-E personnel keep you informed of the latest regulator operation and maintenance techniques to save you money year after year.
- Rapid renewal parts shipment, within 48 hours on common replacement items, cuts outages to a minimum. Nationwide network of G-E service shops stays open 24 hours a day, 7 days a week to give service when you need it—and fast. Quick regulator delivery from *local* G-E warehouses helps you meet storm-caused emergencies.

Service that saves you money during planning, installation, and operation is another reason why General Electric regulators cost less on the line! Ask your G-E regulator representative for detailed information. General Electric Company, Schenectady 5, N. Y. 456-01

Progress Is Our Most Important Product

GENERAL ELECTRIC

For phone number of closest representative see advertising index in back of book.



This educational display of electrical wire, cable and conduit was presented to Stanford University by Kaiser Aluminum & Chemical Corp. It will be used by the School Planning Laboratory to give students basic information on electrical applications and cost savings in school construction. Dr. James D. MacConnell, director of the laboratory, is at left, studying cable samples from the board, which was presented by Gillette N. Houck, an executive in Kaiser Aluminum's Electrical Conductor Division

---

► **Richard E. Cook** and **Reg Martenson** have been named associates in the **Joseph M. Doyle** consulting electrical engineering firm in Spokane. Martenson, who has been with the firm for four years, is now handling engineering work on construction of the new South Side high school in Spokane. Cook, who has been with the firm for two years, is doing engineering work for the Spokane area Atlas missile bases.

► **Thomas M. Byrd** has been appointed manager of **Kaiser Steel** Corp.'s Southern District sales office at Los Angeles. He succeeds Fred G. Brear who was recently appointed manager, customer services, at the company's home office in Oakland. Byrd has been with the Southern District sales office since he joined Kaiser Steel in 1951.

► **F. E. Bennett** Co., 426 N. W. Sixth Ave., Portland, has added the **Kelley** Co. line of Hi-Lo dock boards. These boards adjust automatically to height as a truck backs to them.

► **Moe Levin** of M. Levin Co., Portland, has again been awarded Eagle Electric Co.'s national prize for selling the largest order of Eagle Electric equipment in 1959. He won the prize in 1958 also.

New Facilities

Lighting Dynamics, manufacturer of fluorescent lighting equipment, has broken ground for a new $2 million plant near La Puente, Calif. The 100,000-sq-ft facility will be situated on an 11½-acre site.

The **Graybar Electric** Co. expects to move in May to a $750,000 office-warehouse building now under construction at 1919 Sixth Ave., So., Seattle, according to John P. Pawton, Northwest manager.

Additional facilities have been completed in Los Angeles for I-T-E Circuit Breaker Co., **Kelman Power Circuit Breaker Division.** The 40,000-sq-ft expansion will be used for production of high-voltage oil circuit breakers.

Thermador Division of Norris-Thermador has begun construction of a $100,000 building to house its service department. The 25,000-sq-ft facility will be situated on a five-acre site adjacent to Thermador's main manufacturing plant and will be used exclusively as a customer service headquarters for both local and national operations.

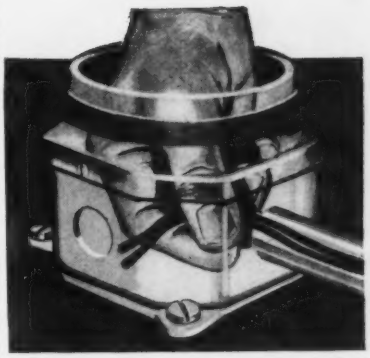
Nu-Art Lighting & Mfg. Co., Salt Lake City, plans to expand into a new $150,000 building at 2450 W. 21st South, Salt Lake City, according to Herbert R. Schoepf, founder of the company. Both production and employment are to be doubled in the 30,000-sq-ft building. The company has been located at 235 E. Fifth South and manufactures commercial, filling station, billboard and outdoor floodlighting equipment.

Harvey Hubbell Inc. moved to a new office building and warehouse at 121 W. Elmira St., Los Angeles 12.

California Electric Construction Co., Los Angeles, says that plans are under way to establish an additional office in Santa Ana, Calif.

Jay-El Products Inc. has moved to new 3,000-sq-ft quarters in Gardena, Calif. The firm offers color-coating process for lamps, indicator lights and switches.

Westinghouse Electric Supply Co. has moved its Arizona headquarters into a new building at 2001 N. 23rd Ave., Phoenix. The 25,000 sq ft of floor space will be used for office, warehouse and display areas. Since



The **"TRU-LEVEL"** ***adjustable*** **FLOOR BOX Is Easy To Install**

The #190 "Tru-Level" box is a standard 4 inch octagon, sheet steel box—and is watertight.
Concrete can be poured to very top, also to box-body height only. A second tin lid is provided. The box-body has a 3¼" opening, making it easy to get hand into for conduit attachment or wire-pulling.
A skin tight plastic collar seals out moisture while protecting the adjusting-ring threads and also keep open an avenue for hand to fit down through concrete.
Adjusting-ring is designed to fit all popular size and style receptacles—you simply clip off plaster ears and drop into place.
Listed under re-examination services of Underwriters Laboratories, Inc.

Latrobe Products
Non-Adjustable Floor Boxes
Adjustable Floor Boxes
Gang Boxes—Cover Plates
Junction Boxes—Nozzles
Pipe or Conduit Hangers
Insulator Supports
Cable Supports—Fish Wire
Staple and Cable Clips

Sales Representatives in all principal Cities:

PAYNE & SLOAN
1101 East 5th St. Los Angeles 13, Calif.

L. F. CHURCH COMPANY
750 Natoma Street San Francisco 3, Calif.

HARVEY M. OLMSTEAD COMPANY
PO Box 5512 T.A. Denver 17, Colo.

WIANT PRODUCTS COMPANY
1231 N. W. Hoyt St. Portland 9, Ore.

R. C. ENGLISH & ASSOCIATES
4229 122nd, S. E. Bellevue, Wash.

SOLD ONLY THRU WHOLESALERS

Fullman
MANUFACTURING COMPANY
1209-1215 JEFFERSON ST.
LATROBE, PENNSYLVANIA

NEW! TECO 3-way, 115 KV switches mounted on only 3 poles instead of 12 pole conventional mounting

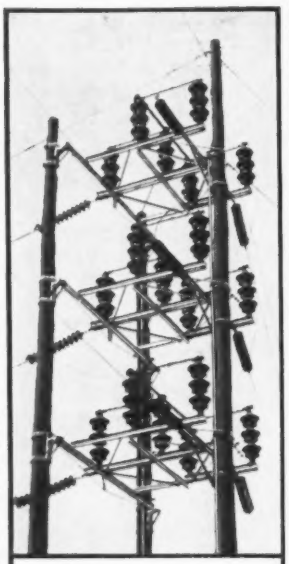
TECO 3-way switches are saving utilities up to 50% on installation costs—and provide the convenience of one switching location.

Save on real estate. A three pole mounting takes only a fourth of the area required by 12 poles, making TECO switches especially suitable where land is at a premium.

Save on materials and maintenance. With TECO 3-way switches, there are 9 fewer poles and far less hardware to buy. You realize additional over-the-years' savings because there is less equipment to maintain.

Save on line-crew time. A complete TECO installation can be handled by one line-crew in about 16 hours, whereas, a conventional installation can require up to 48 hours for one line-crew to complete.

Available switch sizes are 15KV thru 161KV from 600 to 1200 amps. Write today for bulletin 101.



TECO 3-way switches are designed to protect against outages.

50% less dead-end bells.

30% less switch insulators.

Full static wire protection.

Ultra-high speed arcing springs to clear charging currents.

TURNER ELECTRIC CORP.
9500 ST. CLAIR AVE. • EAST ST. LOUIS, ILL.

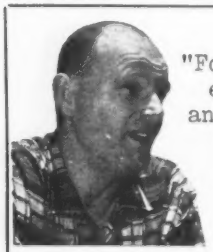
Flexi-Band and thru Bolt Cluster Transformer Mounting Brackets • Complete Line of Air Break Switches • Dead-End Band Brackets

WANTED!

Sales Electrical Engineer for G.E. apparatus sales and wholesale electrical supplies, with well established company. Permanent position with a good future. State qualifications. Inquires will be held strictly confidential. Write Box 310 Electrical West, 68 Post Street, San Francisco 4, Calif.

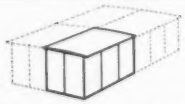
SALES ENGINEER
Wanted

By nationally known manufacturer of High Voltage switchgear equipment for Northwest area. Engineering or selling experience in utility field preferred. Prompt interview arranged. Write with resume to Box 311, Electrical West, 68 Post Street, San Francisco 4, Calif.



"For a combination electrical field office and storage shed that's quick to move on and off the job, I like Porta House. We have them on several jobs."

Just telephone Porta House collect and get immediate delivery. Prefabricated, bolted, waterproof plywood panels—can be moved on a pick-up truck.



SIZES 6' OR MORE BY 9' OR MORE.

PORTA HOUSE
Ridgely K. Dodge 6767 Broadway Terrace, Oakland, Calif.
Phone collect for immediate delivery: OLympic 2-7237

1951 Wesco has shared 35,000 ft with Arizona headquarters of Westinghouse Appliance Sales and apparatus sales and engineering at 1110 N. 21st Ave., Phoenix. William E. Hurford is Wesco's Arizona manager.

The move also will enable **Westinghouse Appliance Sales** to double its facilities. William Tyra, Phoenix appliance manager, announced plans to remodel the appliance offices, warehouse and service facilities.

Westinghouse Apparatus Division's Arizona headquarters remain at 1110 N. 21st Ave., Phoenix. William T. Michael is Arizona apparatus manager.

► Appointment of **J. I. Bocinsky** as manager of the North Salt Lake branch of **Electro - Motive Division of General Motors** was announced by **R. A. Stoddart,** director of branch operations. Bocinsky, who had been plant superintendent, succeeds the late J. S. Chisholm. He joined Electro-Motive in 1938.

Bocinsky

► **National Changes**—C. B. Burnett has been elected president of **Johns-Manville.** . . Howard A. Frey has been appointed general manager of the **insulator department, G-E.** . . James F. Zboyovsky is now manager of **Thomas Works,** Delta-Star Electric Division, H. K. Porter Co. . . E. F. Wentworth Jr. and F. M. Pyzel have been made vice-presidents of **Foster Wheeler Corp.** . . Daniel A. Konetski is Teflon manager of **Sequoia Wire & Cable Co.** . . Robert B. Ames is manager-marketing at **G-E's medium transformer department.** . . **Wagner Electric** has promoted Harold N. Felton from vice-president, sales, to vice-president, marketing, and a director of the company. . . William Deans, former associate of Thomas A. Edison and pioneer in circuit breaker design, resigned from active service with **I-T-E.**

► **Lester C. Hart,** 75, founder and retired president of the Hi-Voltage Equipment Co., now a division of Joselyn Mfg. & Supply Co., and holder of 18 patents in electrical engineering, died at his home in Shaker Heights, Ohio.

► **James H. Greene,** 65, president of the Brewer-Titchener Corp., died Feb. 1 of heart failure following influenza.

Compiano

Treadwell

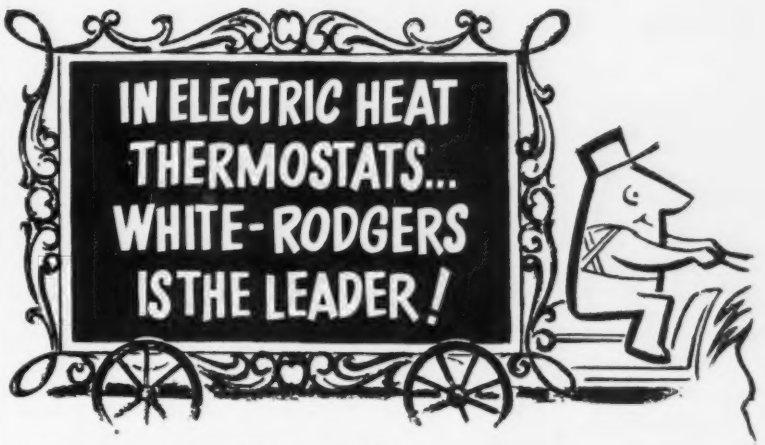
► **Walter L. Treadwell** has been named assistant general manager and **L. L. Compiano,** purchasing agent of **Pacific Coast Engineering** Co. Treadwell had been industrial engineering manager. Compiano takes the place of M. H. LaRue, who retired.

► **James F. Young** has been made general manager—electric utility systems engineering and planning operation—in **G-E's** newly formed electric utility group. The company recently reorganized its apparatus and industrial group into two components—an industrial and an electric utility group. Appointment of **Arthur F. Vinson,** a vice-president, as executive of the industrial group and of **Clarence H. Linder,** vice-president, to head the utility group, was announced earlier.

► Oregon and Seattle sales activities of **Rome Cable Division of Aluminum Co. of America** have been consolidated with the Alcoa branch sales offices. At Portland sales offices at 1224 S. W. Morrison have been discontinued and **C. K. Shanks,** Rome salesman, is now at the Alcoa office in the U. S. Bank Bldg. In Seattle, **A. M. Mitrovich,** Rome district sales manager, and **L. R. Hennings** have moved to 1411 Fourth Ave. Bldg. The Rome warehouse at 3430 Fourth Ave., South, will continue in operation.

► **Airtemp Division of Chrysler Corp.** has established its first West Coast branch office and warehouse at Los Angeles. The 30,000-sq-ft office-warehouse is at 6001 E. Randolph St., Los Angeles 22. **Sydney Anderson** is manager of the new air conditioning and heating branch.

► **Subox** has announced a new appointment in the West. The **Fred H. Carlson Co.** of Seattle will be sales representative for Washington, Montana, and northern Idaho. Offices are at 1201 Dexter Ave., Seattle 9, and at Butte. **William J. Cottrell & Associates,** 4000 S. W. Macadam Ave., Portland, will continue as Oregon and southern Idaho representatives.



Use them with confidence—they're specifically designed for Electric Heat by White-Rodgers—world's largest maker.

Sold under the brand names of more than fifty manufacturers of quality electric heating equipment.

Type 1A61
World's Largest Seller

Type 1A65
Elegant New Companion

LIVE BETTER ELECTRICALLY

WR

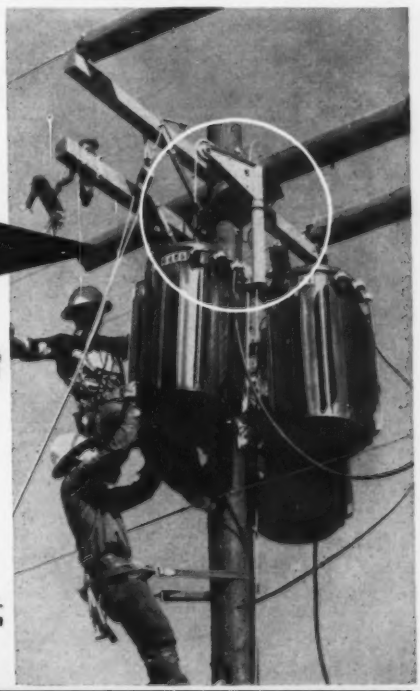
Write for full color folder R 1625

WHITE-RODGERS CO., ST. LOUIS 6, MISSOURI TORONTO 8, CANADA
Portland 12, Oregon • 2846-52 N.E. Glisan • Los Angeles 25, California • 201 Glendale Blvd.

Cut costs... Provide greater safety with a MO PE CO Transformer Hoist

- One position base mounting
- Swivel head permits multiple mounting
- Lightweight 2 piece portable unit (42 lbs.)
- Assembles easily at top of pole
- Tested at 3000 lbs. lift on cable
- Uses steel cable or manila rope

Save time with the MoPeCo hoist. You can install 3 transformers in only 30 minutes!



Order through your favorite distributor

Write or call
MORRISON-PELSUE CO.
Denver, Colorado
2001 So. Bannock St. RAce 2-2834

People

Mortell

Gallotte

Personnel Changes At Puget Power

Richard P. Mortell has been promoted from assistant operating manager to manager of operations by Puget Sound Power & Light Co. He replaces A. L. Pollard, who retired Nov. 20.

In another recent appointment, Willard A. Gallotte became manager of engineering, after serving previously as supervisor of engineering.

Mortell joined the company as an armature winder in 1924, served as chief electrician and superintendent of the division of power before becoming assistant operating manager in 1957. Gallotte started with the company as an engineer in 1927, and has served in a variety of capacities.

In other organizational changes, F. H. Ferguson became planning engineer; J. J. Dempsey Jr., standards and methods development engineer; Pat F. Hargreaves, electrical engineer; Lyman M. Chitty, land and right-of-way engineer; and Elwood C. Avery, project coordinating engineer.

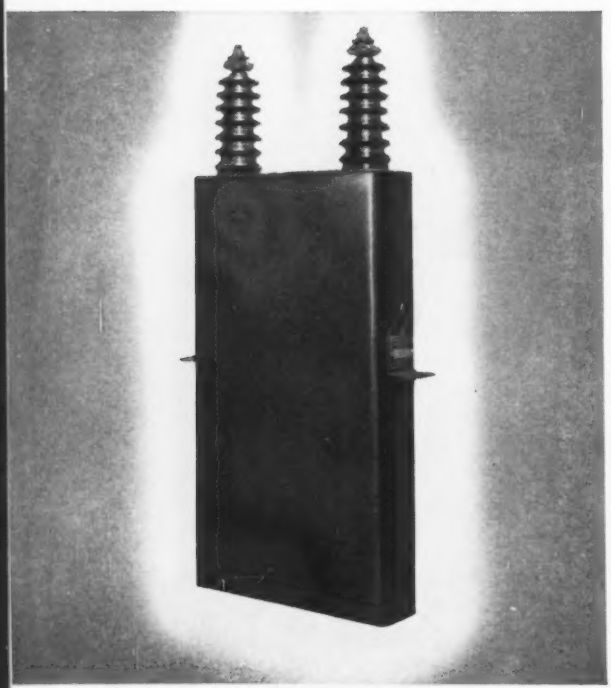
Pollard started with Stone & Webster in 1915 and joined Puget in 1930 as superintendent of the steam division. He became general superintendent of operations in 1945 and operating manager in 1950.

► **William R. Gianelli,** rated as one of the top men in the growing California Department of Water Resources, is stepping out of state service to go into the private consulting engineer business. Gianelli will link up with the engineering firm formed several months ago in Glendale, Calif., by Max Bookman and Robert Edmonston, also formerly with the Department of Water Resources. Gianelli will be in charge of the firm's Sacramento office. He played a leading role in the drafting of the legislation providing for a $1,750,000,000 bond issue to finance a gigantic California water and power development program. The bonds will be voted upon in November's election.

► **Theron W. Ragsdale,** chief of the operations division of the Portland District, U.S. Army Engineers, has been promoted to the GS-15 civil service rating, next to highest in the civil service scale. The higher rating was approved by Lt. Gen. Emerson C. Itschner, Chief of Engineers, on basis of Ragsdale's normal work load plus the additional responsibility for the many multiple-purpose projects in the Portland district, largest unit in the Army Engineers' organization.

► **Baxter L. Schroeder** has been appointed Western regional sales manager of the Utility Division of Highway Trailer Co. Prior to joining Highway Trailer in 1955, he was with the Milwaukee Forge & Machine Co., Ampco Metal Inc. and the Yates American Machine Co.

G-E "COMPACT ISOKRAFT* 50" CAPACITORS OFFER



*Trademark of General Electric Co.

LOW-COST

"COMPACT ISOKRAFT 50" Capacitors now weigh only 82 pounds—the smallest, lightest 50-kvar units on the market today. The 17 percent weight reduction and 20 percent volume reduction from the General Electric "ISOKRAFT 50" unit, introduced in 1959, mean faster, easier installation of individual units or equipments. And reduced installation time means lower installation cost.

One lineman can bring the new "COMPACT ISOKRAFT 50" capacitor to the base of a pole while his partners make other preparations for installing the unit in a hanger or in an existing pole-type equipment. Hand holes in the unit carton facilitate easy handling of boxed units in warehouses and in transit to the installation.

Directors Promote Two at New Mexico PS

Ralph T. MacBain was named financial vice-president and secretary of Public Service Co. of New Mexico, stepping up from secretary-treasurer, a post he has held since 1951.

Fritz Allen, assistant secretary-treasurer, was promoted to treasurer and assistant secretary.

McBain has been in the industry since 1925 when he joined Cities Service in New York. He was elected secretary of the Albuquerque Gas & Electric Co., predecessor to Public Service of New Mexico, in 1946. Allen started with the predecessor company in 1942 as chief clerk.

Changes at Montana Power

Retirement of J. B. Meghen as manager of the budget department of the Montana Power Co. after 39 years with the utility was announced by J. E. Corette, president and general manager. Theodore Cann, chief auditor, succeeds him.

Meghen joined the company in August 1920. He was first assigned to customers' records in the Butte Division office. At that time, he recalls, it required the efforts of a skilled records man for half a day to make out bills for a route of about 250 customers. Today the job is done electronically in about three minutes.

In 1923, Meghen was assigned to the general office accounting department, where he remained until he was named manager of the budget department in 1944.

Cann has been with Montana Power since 1922. His post as chief auditor is being taken by J. F. Doran.

► **Carlton J. Daiss** has joined Anaconda Wire & Cable Co. and will work on the sales force under William K. Gaylord, district manager at San Francisco. A graduate of University of California, he will specialize in utility and government sales. He went to Anaconda from Federal Pacific Electric.

Daiss

► **W. R. Notter,** former partner in George E. Hohn Co., San Francisco, has joined Scott Buttner Electric Co., Oakland, as manager.

► Appointment of **Titus G. LeClair** as manager of nuclear power applications for General Dynamics Corp.'s General Atomic Division was announced last month. LeClair moves to San Diego from Chicago, where he has been manager of research and development for Commonwealth Edison Co. He has been an official of the Nuclear Power Group Inc., which co-sponsored Commonwealth Edison's recently completed Dresden nuclear power plant at Joliet, Ill. He also has served in advisory capacities to the Atomic Energy Commission and Joint Congressional Committee on Atomic Energy.

LeClair

► **Joseph M. Smith,** president-owner of Joseph M. Smith Co. Inc., manufacturers' representative, Los Angeles, and Electric Club member since 1949, died Jan. 14.

INSTALLATION

Further improvements in ISOKRAFT* paper dielectric and refinements in quality control and manufacturing techniques have made this capacitor possible. The new unit utilizes the lower, flatter watts loss characteristic and high dielectric strength of the ISOKRAFT paper.

For complete information contact your G-E Apparatus Sales Representative, or write for bulletin GEA-7061, General Electric Co., Section 445-31, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Radially laminated cores for single phase transformers

By E. H. Stauffer, Project Engineer, Brown Boveri Corp.

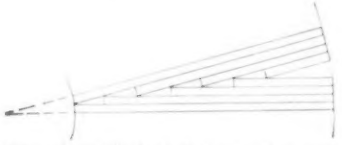
BROWN BOVERI

Brown Boveri's radially laminated cores allow the design of high-rating units with reduced height and weight and greater efficiency . . . to meet rail and highway limitations and to reduce costs.

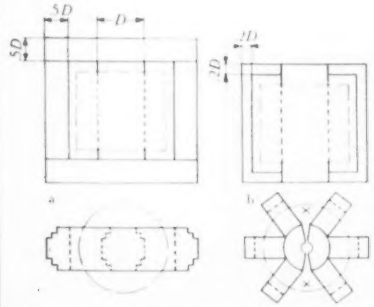
Magnetic flux passes in and out of a transformer core through the edges of the core laminations. Thus, in a parallel laminated core, flux flows only in parallel planes. In a radially laminated core, flux enters from all directions — providing a number of advantages:

Reduced height.

Yoke height is reduced to about 20% of limb diameter. A large single-limb transformer with a 40" diameter radially laminated core, for example, will save up to 5 ft. of building height or shipping clearance as compared to conventional three-limb transformers.



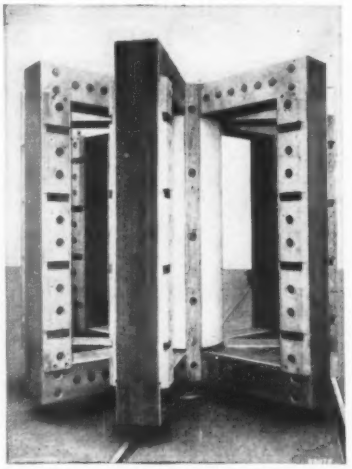
Sector of radially laminated core. Core space utilization is comparable to that of stepped parallel laminations.



Height comparison for large single-phase transformers. a — parallel laminations. b — radial laminations. Empty sectors at x allow room for connections or taps to inner coils.

Lower losses.

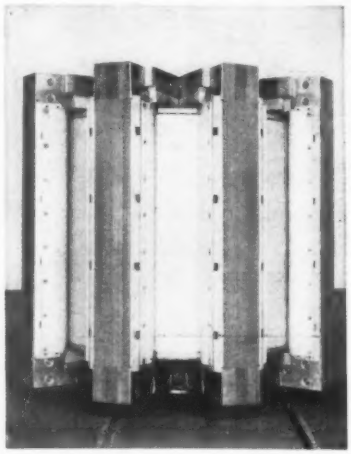
All core laminations face edgewise to the concentrically arranged coils . . . reducing stray losses and eddy currents to a minimum.



Radially laminated core for single phase transformer, before winding.

Lower material costs.

The lower yoke height means considerably less iron is required. The lower, horizontal parts of the yokes also serve as coil supports so that elaborate bases are eliminated. The simple circular tank needs no wall reinforcements, uses a minimum amount of oil.



Radially laminated core for single phase transformer with winding in place.

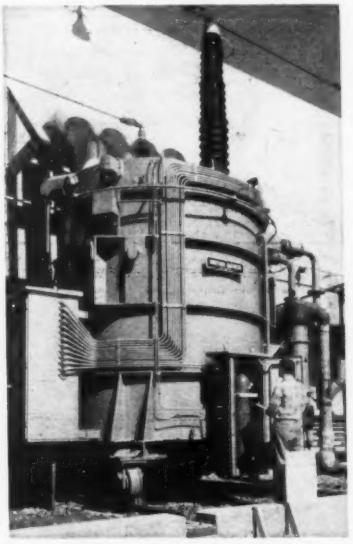
Lower assembly costs.

Butt-jointing of yokes eliminates interleaving of yoke and core laminations, simplifies construction.

Other core construction features:

Special selection and preparation of core sheets and the use of non-magnetic or shielded pressure plates, bolts and screws reduce no-load current and iron losses. Yokes are tied rigidly to the central core with non-magnetic bolts for minimum noise level.

The total capacity of Brown Boveri transformers built with radially laminated cores is now over ten million kva. *None has shown any trace of iron troubles.*



One of 13 Brown Boveri single phase transformers with radially laminated cores at Robert Moses Dam, Massena, N. Y. All are 3-winding type, equipped with forced oil-water heat exchangers and rated 86,000 kva. Six are 115-13.2/13.2 kv, six are 230-13.2/13.2 kv. The spare is reconnectable for either voltage.

NOTE: Brown Boveri's "Splayed Flange Insulation" also reduces transformer size by reducing the distance between windings and the size of the core. This unique insulation is described in another advertisement.

BROWN BOVERI Brown Boveri Corp., Dept. 19 Rector Street, New York 6, N. Y. Agents in 27 U. S. cities.

INDEX TO ADVERTISERS AND WESTERN SALES OFFICES

March 1960

Allen-Bradley Co. 17, 18
Los Angeles ..... ANgelus 9-9421
San Francisco: Campbell & George ..... MIssion 8-1236
Denver: Young Electric ..... AComa 2-4841
Albuquerque: A & A Supply ..... ALpine 6-0307
Salt Lake City: Stevens Sales ..... INgersoll 7-5489
Phoenix: Edw. P. Weller ..... AMherst 6-3188
Seattle: J. A. Tudor Associates ..... MUtual 2-7444
Portland: J. A. Tudor Associates ..... BEImont 2-1188

Allis-Chalmers Mfg. Co. 49, 51, 53, 55, 57
San Francisco ..... DOuglas 2-8384
Los Angeles ..... MAdison 6-2231
Phoenix ..... CRestwood 4-5426
Denver ..... CHerry 4-6556
Salt Lake City ..... EMpire 3-1723
Portland ..... CApitol 2-9835
Seattle ..... MAin 4-3737

Bechtel Corp. 108
San Francisco ..... DOuglas 2-4032
Los Angeles ..... MAdison 6-6721

Brown Boveri Corp. 126
Portland ..... CApitol 3-7234
San Francisco: Bellove Co. ..... YUkon 2-3713
Pasadena: A. B. Smedley ..... SYcamore 8-1174
Denver: Slaybaugh-Thompson Co. ..... AComa 2-5826
Tucson: Central Station Equip. Co. ..... MAin 3-2493

Buchanan Electrical Products Corp. 119
Los Angeles: Frank Rozema ..... MAdison 9-3855
Denver: Fred A. Pease Co. ..... DUdley 8-4643
Portland: Keeler-White ..... CApitol 7-0593
Seattle: Keeler, White, Inc. ..... MAin 3-2367
Vancouver, B.C., Walter McHugh ..... CHerry 3034

BullDog Electric Products Div.,
I-T-E Circuit Breaker Co. 15
Oakland: Safety Switchboard Co. ..... LOckhaven 2-4945
Los Angeles: BullDog Elec. Products of L. A. ..... ANgelus 9-8101
Portland: Coast Elec. & Mfg. Co. ..... ATlantic 8-5373
Denver: Young Elec. & Mfg. Co. ..... AComa 2-4841

Carol Cable Co., Div. Crescent Co., Inc. 35, 36, 37, 38
San Francisco: F. M. Nicholas ..... YUkon 2-1964
Los Angeles: Payne & Sloan, Inc. ..... MAdison 4-7317
Seattle: Bruce-Emmett Co. ..... MUtual 2-6737
Portland: Bruce-Emmett Co. ..... BEImont 2-8117

Chance Co., A. B. 42
San Francisco ..... MIssion 7-1300
Seattle ..... MUtual 2-8920
Portland ..... CApitol 8-3866
Los Angeles ..... LUdlow 2-1090

Circle Wire & Cable Co. 54
Sub. of Cerro de Pasco Corp.
San Francisco: Brill Electric Sales ..... SUtter 1-7547
Los Angeles: Elkins Electric Agency ..... ANgelus 8-3385
Seattle: Electric Agencies ..... MAin 3-2360

Classified 122

Conduit Nipple Mfg. Co. 119
San Francisco: George Gray Co. ..... HEmlock 1-1526
Los Angeles: Haviax Co. ..... MAdison 8-5256
Portland: Pacific Elec. Sales Co. ..... BEImont 5-4137
Denver: Reitz Sales Co. ..... EAst 2-6200

Curtis-AllBrite Lighting, Inc.
Curtis Lighting Division 60, 61
All-Brite Lighting Div. in following cities:
South San Francisco ..... PLaza 5-7077
Monterey Park, Calif. ..... ANgeles 8-1144
Seattle ..... EAst 5-9600
Denver ..... SKyline 6-1668

Eagle Electric Mfg. Co., Inc. 118
San Francisco: Brill Electric Sales ..... SUtter 1-7547
Los Angeles: D. Niemann ..... MAdison 6-7736
Portland: M. Levin ..... CApitol 2-9591

Fanner Mfg. Co. 58, 113
San Francisco: Sold Through Line Material Industries ..... PLaza 5-8600
Los Angeles ..... RAymond 3-6251 and OXford 5-2260
Phoenix ..... ALpine 4-8471
Denver: Slaybaugh & Thompson ..... AComa 2-5826
Portland: A. L. Polich ..... CApitol 3-6241

Fargo Mfg. Co. Inc. 62
Sold thru Line Material Industries:
San Francisco: ..... PLaza 5-8600
Los Angeles: ..... RAymond 3-6251 and OXford 5-2260
Denver ..... FLoride 5-1689
Portland ..... CApitol 2-1981
Seattle ..... ATwater 3-6368
Spokane ..... KEystone 5-2461
Salt Lake City ..... ELgin 5-6257
Phoenix: J. E. Redmond Co. ..... ALpine 4-8471

Fisher-Pierce Co. Inc. 104
San Francisco: Maydwell & Hartzell ..... ATwater 8-6900
Los Angeles: Maydwell & Hartzell ..... MAdison 8-7245
San Diego: Maydwell & Hartzell ..... CYpress 6-2245
Phoenix: Maydwell & Hartzell ..... ALpine 2-5858
Seattle: Oscar Hogenson ..... MAin 2-0737
Portland: J. A. Tudor Asso. ..... BEImont 2-1188
Denver: Allen I. Williams ..... MAine 3-0343

Fullman Mfg. Co. 121
San Francisco: L. F. Church ..... UNderhill 1-2840
Los Angeles: Payne & Sloan ..... MAdison 4-7317
Denver: Harvey Olmstead ..... TAbor 5-6264
Bellevue, Wn.: R. C. English ..... GL 4-0566
Portland: Wiant Products ..... CApitol 7-2671

Geigy Agricultural Chemicals 63
Div. of Geigy Chemical Corp.
Los Angeles ..... ANgelus 3-3855
Portland ..... CApitol 7-4167

General Electric Co.
Cleveland, Lamp. Div. 52
Oakland ..... LOckhaven 9-3222
Los Angeles ..... DUnkirk 5-1681
Denver ..... AMherst 6-0285
Seattle ..... MAin 2-8081
Portland ..... CApitol 3-2101

General Electric Co.
Schenectady, Apparatus Div. 25, 26, 27, 100, 101, 120, 124, 125
San Francisco ..... DOuglas 2-3740
Los Angeles ..... MAdison 5-7381
Phoenix ..... ALpine 8-7724
Denver ..... KEystone 4-7171
Boise 4-3021
Salt Lake City ..... EMpire 4-1891
Portland ..... ATwater 8-0281
Seattle ..... MAin 4-8300

Graybar Electric Co. Inc. 58, 59
San Francisco ..... MArket 1-5131
Los Angeles ..... ANgelus 3-7282
Phoenix ..... ALpine 2-2371
Denver ..... TAbor 5-7111
Boise ..... BOise 3-2594
Butte ..... BUtte 3233
Portland ..... ATlantic 8-5661
Seattle ..... MUtual 2-0123
Salt Lake City ..... ELgin 9-8771

Hill Transformer Works ..... 4th Cover
Delta-Star Electric Div., H. K. Porter Co. Inc.
San Carlos ..... LYtell 1-4461
Albuquerque: Ralph B. Black ..... ALpine 5-9625
Los Angeles ..... MAdison 6-5651
Phoenix:
Daley Elec. Sales Co. Inc. ..... ALpine 2-2326
Salt Lake City:
Stevens Sales Co. ..... INgersol 7-5489
San Francisco ..... GArfield 1-2916
Seattle ..... MAin 4-7066
Tucson: Daley Elec. Sales Co., Inc. ..... AXtel 5-5378

Holophane Co. Inc. 99
San Francisco ..... YUkon 2-9655
Bremerton, Wash. ..... TRiangle 6-4069
Montebello, Calif. ..... RAymond 3-5738
Littleton, Colo. ..... PYramid 4-4527

Hubbell, Inc., Harvey 112
San Francisco ..... Mission 7-3240
Los Angeles ..... MAdison 8-7226
Denver: Paul A. Douden ..... KEystone 4-6798
Spokane: Elmer Johnson ..... MAin 2518
Seattle: Frank A. Strohecker ..... MAin 3-0357
Portland: David King ..... CApitol 8-1990

Indiana Steel & Wire Co. Inc. 98
Graybar in following cities:
San Francisco ..... MArket 1-5131
Los Angeles ..... ANgelus 3-7282
Portland ..... ATlantic 8-5661
Seattle ..... MUtual 2-0123
Denver ..... TAbor 5-7111
Salt Lake City ..... ELgin 9-8771

International Business Machines 116
Los Angeles ..... DUnkirk 1-3696
San Francisco ..... YUkon 2-0100
Denver ..... AComa 2-9373
Seattle ..... MUtual 2-4640
Portland ..... CApitol 8-6623
Salt Lake ..... ELgin 9-7721

I-T-E Circuit Breaker Co. 30
South San Francisco ..... PLaza 6-8660
Los Angeles ..... MAdison 2-7134
Denver ..... AMherst 6-1404
Seattle: Garland-Affolter Eng. Corp. ..... MUtual 2-4950
Portland: Garland-Affolter Eng. Corp. ..... CApitol 3-7349
Salt Lake City: Riter Eng. Co. ..... INgersol 7-9449
Butte: McDonough, R. E. ..... BUtte 2-5447
El Paso: R. L. Brewer Co. Inc. ..... KEystone 2-7651
Tucson: Central Station Equip. Co. ..... MAin 3-2493

Johns-Manville Corp. 48
San Francisco ..... DOuglas 2-4353
Los Angeles ..... LUdlow 7-2141
Seattle ..... MElrose 3-4300
Denver ..... KEystone 4-6378
Salt Lake City ..... EMpire 4-8446
Portland ..... CApitol 3-8260

Kaiser Aluminum & Chemical Corp. 114, 115
Oakland ..... CRestview 1-2211
Los Angeles ..... MAdison 6-4801
Denver ..... ALpine 5-3459
Phoenix ..... ALpine 3-4841
Portland ..... CApitol 6-4351
Seattle ..... MAin 3-7821
Spokane ..... TEmple 8-2704

Kearney Corp., James R. 44
Maydwell & Hartzell, Inc., in following cities:
San Francisco ..... ATwater 8-6900
Los Angeles ..... MAdison 8-7245
Seattle ..... MAin 4-2368
Portland ..... CApitol 8-4173
Spokane ..... MAdison 4-3285
Phoenix ..... ALpine 2-5858
San Diego ..... CYpress 6-2245
Salt Lake City: Conely Engineering Co. ..... EMpire 3-5013
Golden, Colo.: Robert C. Smith ..... CRestview 9-5279

Kerite Co. ..... 3rd Cover
San Francisco ..... GArfield 1-2916
Glendale, Calif. ..... CHapman 5-3721
Seattle: Fred Carlson ..... ATwater 4-4360

Klein & Sons, Mathias 103
Glendale, Calif. ..... CItrus 3-3523
Sunnyvale, Calif. ..... CHestnut 5-2310

Kraloy Plastic Pipe Co. Inc. 31
Los Angeles: ..... Angelus 1-4158
San Francisco: The Curry Co. ..... YUkon 2-0788
Seattle: Fred Carlson Co. ..... ATwater 4-4630
Denver: Kenneth B. Schomann Co. ..... FRemont 7-3023
Albuquerque: Ralph B. Black ..... ALpine 5-9625

Lapp Insulator Co. Inc. 40, 41
San Francisco: Donald E. Ingalls ..... JUneau 6-0332
Los Angeles: Earl S. Condon & Co. ..... DUnkirk 1-3951
Seattle: Charles F. James ..... MAdison 3-1531
Salt Lake City: Riter Engineering Co. ..... EMpire 3-7933
Butte: R. E. McDonough Co. 2-5447

(Continued on page 128)

INDEX TO ADVERTISERS AND WESTERN SALES OFFICES

(Continued from page 127)

McCabe Powers Auto Body Co. 3
Berkeley ..... LAndscape 4-4416
Portland ..... BElmont 6-1178
Pomona ..... NAtional 4-6464
Phoenix ..... BRidge 5-5774
Salt Lake City ..... DAvis 2-5658
Spokane ..... FAirfax 5-2591
Los Angeles ..... RIchmond 9-3424

Moloney Electric Co. 39
Garland Affolter in following cities:
San Francisco ..... EXbrook 7-1800
Los Angeles ..... MAdison 4-1864
Portland ..... CApitol 3-7349
Seattle ..... MUtual 2-4950
Denver: Hamilton Associates ..... CHerry 4-1505
Salt Lake: Riter Engineering ..... EMpire 3-7933

Morrison-Pelsue 123
Denver ..... RAce 2-2834
North Hollywood: A. F. Johnson ..... STate 7-8544
Salt Lake City: W. H. Pingree Co. ..... EMpire 3-6731
San Francisco: Brenton Equip. Co. ..... EXbrook 2-8185
Los Angeles: Golsan Co. ..... RIchmond 7-5486
Spokane: Tinling & Powell ..... TEmple 8-8276

Pacific Gas and Electric Co. 34
San Francisco ..... SUtter 1-4211

Paranite Wire & Cable Div., Essex Wire Corp. 106, 107
Los Angeles ..... RAymond 3-4794
South San Francisco ..... PLaza 6-3030
Portland ..... CApitol 3-6124
Seattle ..... MAin 3-5641

Pennsylvania Transformer Div. 46, 47
San Francisco: George E. Honn Co. ..... SUtter 1-7352
Los Angeles: John G. Corrin ..... MAdison 2-0830
Seattle: Fred W. Carlson ..... ATwater 4-4630
Phoenix: Roy E. Coulson ..... Windsor 3-8935
Denver: Peterson Co. ..... DExter 3-5434
Salt Lake City: Clarence W. Silver ..... ELgin 5-5378
Portland:
Fred W. Carlson & Associates ..... CApitol 8-3798
Boise, Ida.: Clarence W. Silver Co. 2-6947
Albuquerque:
Williamson Sales Co. ..... ALpine 6-6617

Phelps-Dodge Copper Products Corp. 45
San Francisco ..... EXbrook 2-7379
Los Angeles ..... RAymond 3-1311 and PArkview 1-1191
Seattle ..... MAin 3-6790
Denver ..... CHerry 4-9291 and CHerry 4-9292

Porta House 122
Oakland ..... OLympic 2-7937
Sacramento: Robert Cronin ..... GIlbert 3-8543
Portland: Bardi Gen. Contractors ..... PRospect 5-4354
Los Angeles: Constructors Supply Co. ..... LUdlow 3-4158
Los Angeles: Ball & Black ..... ANgelus 9-7586
Santa Ana: Blystone Equip. Co. ..... KImberly 2-3918

Porter Co. Inc., H. K., National Electric Div. 50
San Francisco ..... UNderhill 1-1145
Los Angeles ..... RAymond 3-4654
Seattle ..... MAin 3-3775
Salt Lake City ..... DAvis 2-2701
Denver ..... PEarl 3-3741

Preformed Line Products Co. 103
San Francisco: K. M. Ryals Co. ..... YUkon 2-5510
Los Angeles: Earl S. Condon Co. ..... DUnkirk 1-3951
Seattle: Shaffer & Nelson Inc. ..... MUtual 2-0186
Portland: Shaffer & Nelson Inc. ..... BElmont 4-7437
Salt Lake City: Shaffer & Nelson Inc. ..... ELgin 5-8304
Spokane: Shaffer & Nelson Inc. ..... FAirfax 7-9528
Denver: Peterson Co. ..... DExter 3-5434

R T & E Corp. 7
Portland ..... MErcury 9-2161
Medford: H. L. Mooney ..... SPring 2-9948
San Jose: N. R. Beebe ..... ANdrews 4-5641
Pasadena: D. B. Cole ..... SYlvan 0-5977
Salt Lake City: T. R. Van Wagoner Co. ..... INgersol 6-2461
Bellevue, Wn.: K. H. DuBois ..... SHerwood 6-4114
Billings: W. L. Lassen ..... ALpine 9-9306
Anchorage: J. P. Bagoy ..... BRoadway 7-8011

Reliable Electric Co. ..... 2nd Cover
Palo Alto, Calif.: D. B. Evans ..... DAvenport 5-0230
Los Angeles: H. C. Mitchell, Jr. ..... GRanite 8-3418
Mercer Island, Wn.: D. J. Smith ..... ADams 2-8378

Republic Steel Corp. 43
San Francisco ..... GArfield 1-0977
Los Angeles ..... MAdison 4-5144
Portland: Shaffer & Nelson Inc. ..... BElmont 4-7437
Seattle: Shaffer & Nelson Inc. ..... MUtual 2-0186
Spokane: Shaffer & Nelson Inc. ..... FAirfax 7-9528
Denver: C. D. Belt Co. ..... SKyline 6-9421

Rome Cable Div. of Alcoa 28, 29
Los Angeles ..... RAymond 3-3631
San Francisco ..... VAlencia 6-3580
Seattle ..... MAdison 4-3017
Salt Lake City ..... ELgin 9-8811
Denver ..... KEystone 4-0533

Royal Electric Corp. 109
Los Angeles: Eckert-Lloyd Co. ..... RIchmond 7-9655
San Francisco: Eckert-Lloyd Co. ..... HEmlock 1-5792
Seattle: Northwestern Agencies ..... MAin 3-8882
Portland: Northwestern Agencies ..... CApitol 7-0434
Phoenix: Wm. Benndorf ..... CRestwood 7-1662
Denver: Hyde Electronics Co. ..... WEst 6-3456

S & C Electric Co. 20
Burlingame, Calif. ..... OXford 7-1130
El monte, Calif.: Randolph Eng. Corp. ..... CUmberland 3-4183 and 3-7901
Gilbert 3-1701
Phoenix: Randolph Eng. Corp. ..... ALpine 8-5281
Salt Lake City:
Riter Engineering ..... INgersoll 7-9449
Seattle: Muth-Richards Co. ..... EAst 3-2128
Portland: Andrew L. Polich, Inc. ..... CApitol 3-6241

Sangamo Electric Co. 4, 5
San Francisco: L. A. Nott ..... HEmlock 1-4738
Los Angeles: (Factory Sales) ..... DUnkirk 7-2336
(Time Switches) ..... ANgelus 8-6771
Seattle: T. R. Wood ..... MAin 3-8204
Denver: Mt. States Machinery ..... CHerry 4-7421
Phoenix: J. E. Redmond Co. ..... ALpine 4-8471
Portland: R. L. Schoenberger ..... CApitol 3-8742
Butte: R. E. McDonough ..... Butte 2-5447
Tucson ..... AXtel 8-4801
Albuquerque:
Gorman Engineering ..... CHapel 7-1596
El Paso: Gorman Engineering ..... KEystone 2-3449

Southern California Edison Co. 66
Los Angeles ..... MAdison 4-7111

Southern States Equipment Corp. 110, 111
Seattle: Jos. C. Piatt ..... MAin 3-6141
Salt Lake City: H. Lee Rawlings Co. ..... ELgin 9-8811
Denver: R. T. Lewis Co. ..... EAst 2-1082
Los Angeles: W. E. Kirk Co. ..... MAdison 4-3651
Lake Grove, Ore.: C. F. Selby ..... NEptune 6-1486
Oakland: John H. Ormond ..... TWinoaks 3-3235

Square D Co. 105
Los Angeles ..... CApitol 1-1171
San Francisco ..... JUniper 7-4590
Seattle ..... EAst 3-1474
Portland ..... BElmont 4-8488
Denver ..... KEystone 4-6234
Salt Lake City ..... DAvis 2-5859
Phoenix ..... ALpine 8-6448
El Paso ..... KEystone 3-0544
Spokane ..... FAirfax 8-3690
San Diego ..... BElmont 3-7621
Fresno ..... AMherst 8-6268

Superior Cable Corp. 102
Maydwell & Hartzell, Inc., in following cities:
San Francisco ..... ATwater 8-6900
Los Angeles ..... MAdison 8-7245
Phoenix ..... ALpine 2-5858
Portland ..... CApitol 8-4173
Seattle ..... MAin 4-2368
Spokane ..... MAdison 4-3285

Texoma Enterprises, Inc. 118
Los Angeles:
Industrial Eng. & Equip. Corp. DUnkirk 1-1281
Portland:
Western Power Products, Inc. CApitol 7-1384
Seattle: Western Power Products, Inc. LA 2-2009

Truck Equipment Co. 56
Los Angeles: Calavar Corp. ..... RIchmond 8-6292
Oakland: Dailey Body Co. ..... KEllog 4-1423
Portland: Schatky Equipment Corp. ..... BEaverton 4-5344
Spokane: Leland Trailer & Equip. Co. ..... KEystone 4-0591
Salt Lake City: W. H. Pingree Co. ..... EMpire 3-6731
San Francisco: Caesar Baldassari ..... EXbrook 7-1303
San Francisco: FWD Pacific Co. ..... GArfield 1-4971
Seattle:
Robblee Utility Equipment Co. ..... MAin 4-1412
Denver:
Rocky Mountain Export Co. ..... MAin 3-7185

Turner Electric Corp. 122
Fred W. Carlson in following cities
Seattle ..... ATwater 4-4630
Portland ..... CApitol 8-3798
Butte ..... Phone 8916
Los Angeles:
Industrial Eng. & Equip. Corp. ..... DUnkirk 1-1281
Denver: Hamilton Associates ..... CHerry 4-1505

Virden Lighting, Division of John C. Virden Co. 13
Atherton, Calif.: W. G. Sawyer ..... DAvenport 5-4931
Fullerton: Wm. K. Newell ..... TRojan 1-1845
Phoenix: Ray E. Wendling ..... ALpine 2-2541
Seattle: Donald S. Gleason ..... LAkeview 5-5151
Portland: Clyde E. Dodd ..... BUtler 5-3271

Western Insulated Wire Co. 23
Los Angeles ..... LUdlow 7-7103
San Francisco: Curry Co. ..... YUkon 2-0788
Seattle: J. H. Stumph Co. ..... MUtual 2-5232
Albuquerque: John Carder ..... CHapel 2-3581
Salt Lake City:
T. R. Van Wagoner ..... INgersoll 6-2461
Portland: George M. Roth ..... CApitol 7-5654

Westinghouse Electric Corp. 32, 33, 64, 65, 91, 92, 93, 94, 95, 96
San Francisco ..... EXbrook 2-5353
Los Angeles ..... MAdison 6-3881
Denver ..... KEystone 4-8121
Phoenix ..... ALpine 8-8621
Salt Lake City ..... ELgin 5-3413
Seattle ..... MAin 2-0808
Portland ..... CApitol 2-9151
Spokane ..... FAirfax 8-3371

White-Rodgers Co. 123
Los Angeles ..... MAdison 8-1211
Portland ..... BElmont 4-7523
San Francisco: Kenneth Hill ..... WEst 1-2612
Mountlake Terrace, Wash.: L. Wren ..... PRospect 6-5931
Denver ..... BElmont 7-0709

ARE YOU RECEIVING

ELECTRICAL WEST

ON A ROUTE SLIP?

Why not be receiving your own copy? You can have it sent directly to your home where you have more time to read.

For only $3 you will receive 12 regular monthly issues, plus 12 Mid Month Newsletters and the annual Buyers Guide & Directory.

Just put your name, residence address, title and company on a post card and mail to: Electrical West, Circulation Dept., 68 Post St., San Francisco 4, Calif.

East Side, West Side...

All New York links European commerce to our own. This busy city is an important hub in U.S. industry.

In a single year, its privately-owned electric utilities generate more than *fourteen billion* kwh to light its homes and power its industry. Not one, nor ten, but *fifteen* railroads roar in and out: nourishing the city, strengthening it, binding it to the rest of America.

Busy New York would more resemble Nieuw Amsterdam than the photograph you see could it not have come to depend on its *electric utilities* and *railroads*. In both these crucial industries—and all industry—Kerite Cable is a standard of dependability. *When tomorrow's problems occur —Kerite will already be ahead of them.*

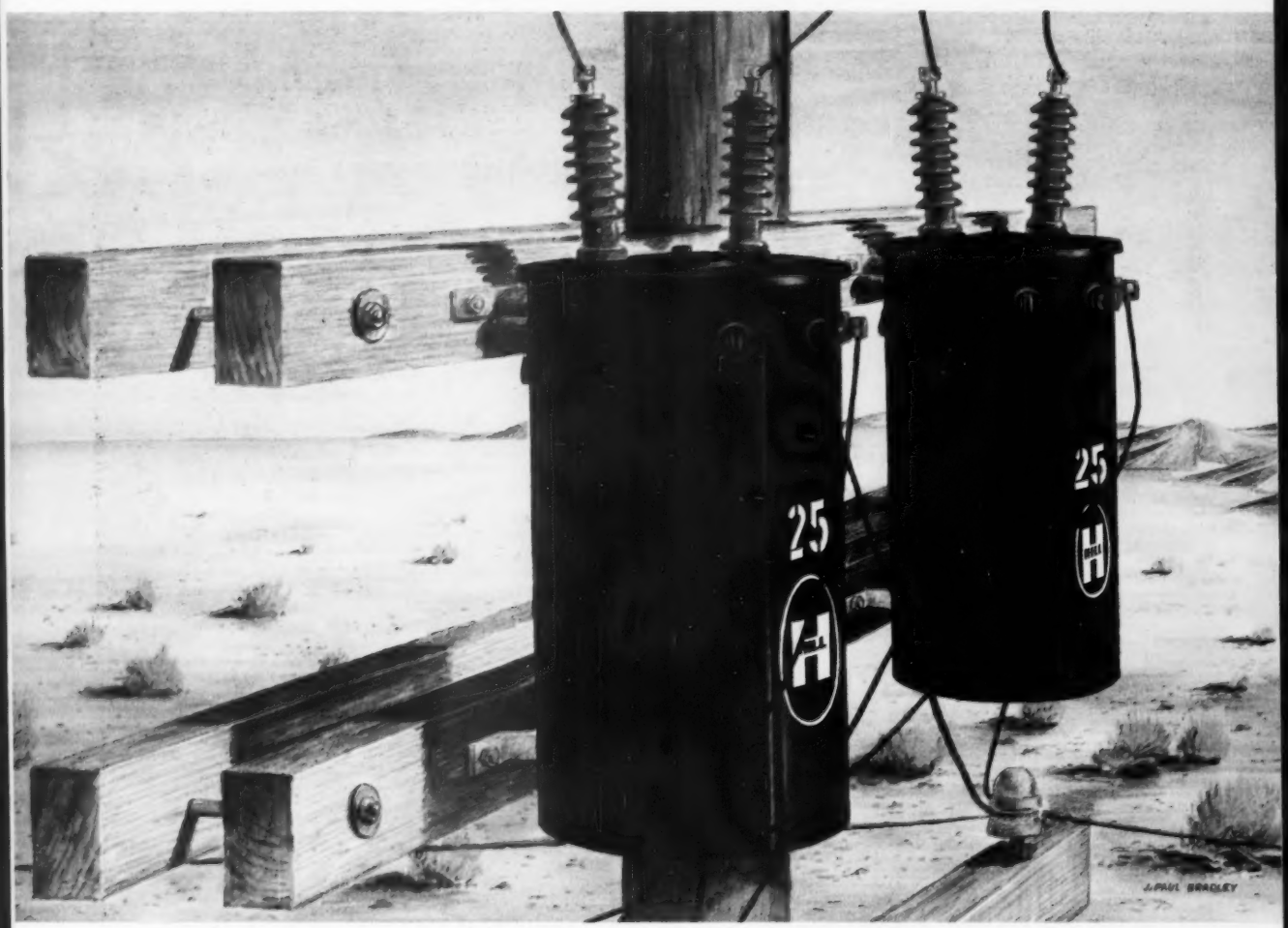
KERITE CABLE

it's the KERITE *that makes the difference*

Our headquarters is at 30 Church St., New York 7.

BRANCHES IN Ardmore, Pa., Birmingham, Boston, Cleveland, Chicago, Houston, St. Louis, Portland, Ore., San Francisco, Glendale, Cal., Seattle

DESERT CAMPAIGNERS



HILL TRANSFORMERS DELIVER MAXIMUM WEATHER PROTECTION WHERE IT COUNTS MOST

Counterattacking hot sun, wind-blown sand, ***Epoxy Resin-Based Paints*** assure against surface paint breakthrough.

For extra armor protection, ***Phosphatizing*** provides the best possible bonding agent for paint—guards against the infiltration of metal corrosives, seals-off damaged areas, prevents spreading.

Terminals are electroplated with nickel for use with either aluminum or copper takeoffs.

Desert, mountain or coastal regions—your safeguard against severe climatic conditions that cause costly transformer maintenance in critical, hard-to-reach locations are built into HILL's new tanks.

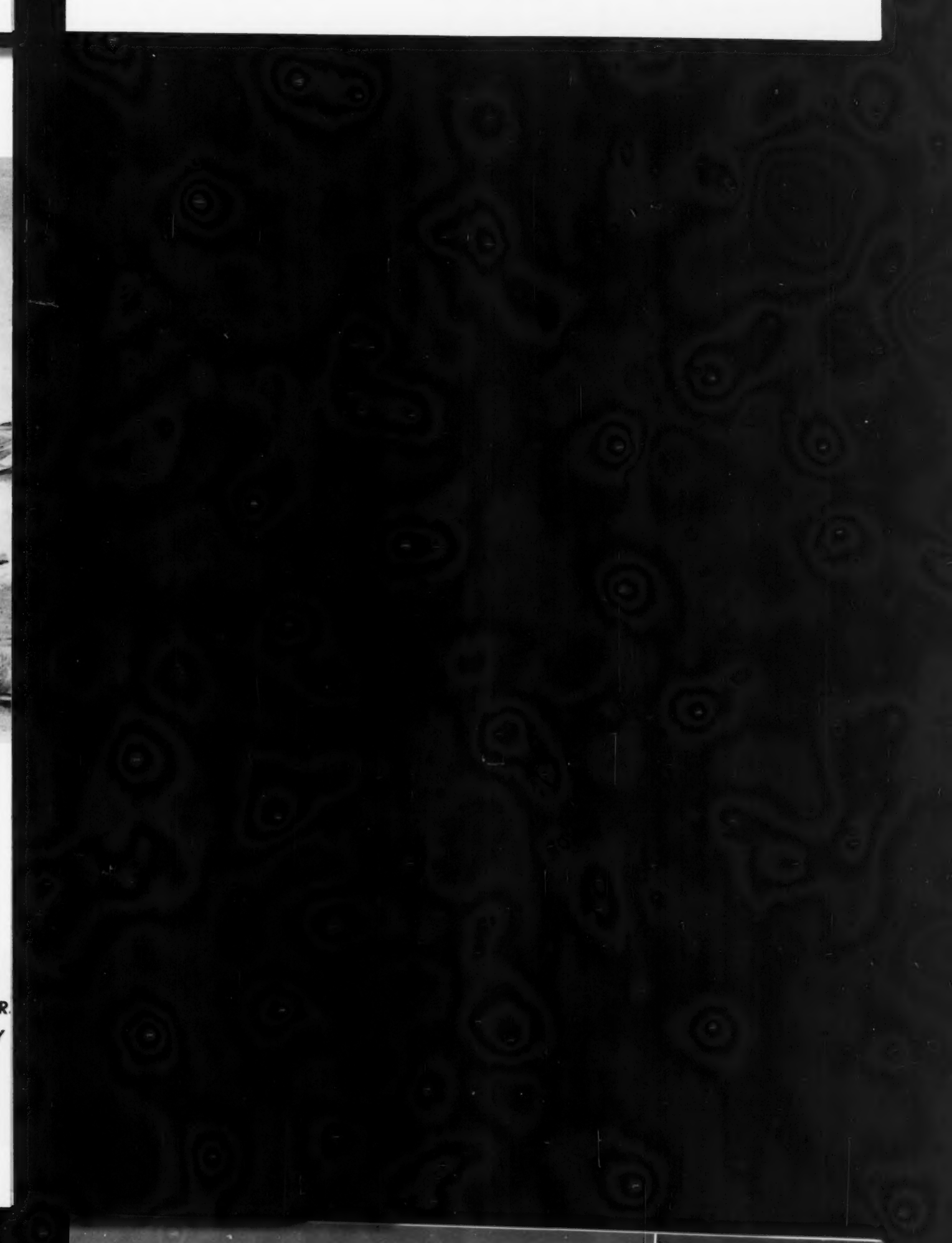
Internal cover clamping, eliminating external clamps that fracture surface paint, is only one of the features you'll want to compare before selecting your next transformers!

HILL TRANSFORMER CO., INC.

1030 WASHINGTON STREET SAN CARLOS, CALIFORNIA

Illustrated literature and complete catalogs are available on request. Hill representatives are located in major cities to answer your immediate problems.

HILL

"TRANSFORMERS THAT STAY IN SERVICE"

Sales representatives in Seattle, Portland, San Francisco, Los Angeles, Phoenix, Salt Lake City, Denver, Kansas City, Albuquerque, Houston, Dallas, Oklahoma City, Minneapolis and Honolulu.